

answer key

to Mathematics
for a Modern World
Book 3, second edition

Burns
Pinkney
Del Grande



CURRICULUM

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Get-Set Exercise 1.1, Page 2

1. (a) -4 (e) -16
 (b) -1 (f) 0
 (c) -12 (g) -3 (i) 1
 (d) 9 (h) -8 (j) -2
2. (a) -7 (e) 8
 (b) -3 (f) 4
 (c) -11 (g) -4 (i) -11
 (d) -4 (h) 21 (j) 1
3. (a) -28 (e) 143
 (b) 40 (f) 0
 (c) 63 (g) -3800 (i) -1
 (d) 12 (h) -260 (j) 0
4. (a) 6 (e) 0
 (b) -3 (f) 7
 (c) -4 (g) -4 (i) 3
 (d) 1 (h) -4 (j) -64
5. (a) -80 (h) -118 (o) 3
 (b) 2 (i) -19 (p) $\frac{17}{30}$
 (c) -16 (j) 12 (q) $\frac{23}{24}$
 (d) 2 (k) -7 (r) $-\frac{2}{7}$
 (e) -6 (l) -6 (s) $-\frac{5}{3}$
 (f) 22 (m) $\frac{41}{51}$ (t) $\frac{3}{4}$
 (g) -6 (n) 9
6. (a) 1 (e) -48
 (b) -4 (f) -1
 (c) 49 (g) 5 (i) 14
 (d) 7 (h) -3 (j) -6
7. (a) -11 (e) -147
 (b) -41 (f) -11
 (c) -3 (g) -5 (i) -343
 (d) 18 (h) 13 (j) 256
8. (a) -40 (e) -4
 (b) -27 (f) 8
 (c) -24 (g) -18 (i) 10
 (d) -7 (h) 110 (j) -60

Exercise 1.2, Page 6

6. (a) $6y^5$ (g) m^2
 (b) 24 (h) $\left(\frac{2}{3}\right)^3$
 (c) 27 (i) $\frac{1}{2}$
 (d) $\frac{32}{52}$ (j) $\frac{m}{5}$
 (e) 72 (k) $(-2x)^8$ or $(2x)^8$
 (f) $10r^8$ (l) $\frac{y}{2}$
7. (a) x^9 (e) $\frac{x^2}{y^2}$
 (b) $\frac{4}{9}$ (f) $\frac{y^6}{x}$
 (c) $\frac{-m^{13}}{n^{12}}$ (g) $\frac{3^6}{5^3}$
 (d) $\frac{m^3}{n^6}$ (h) 2^2
8. (a) 2^7 (e) 3^3
 (b) $12x^5 y^3$ (f) $2x^7 y^2$
 (c) $\frac{5}{c^3 d}$ (g) $6x^{12}$
 (d) 6×10^{12} (h) 8.6×10^9
9. (a) a^{x+y}
 (b) a^{x-y}
10. (a) a^{xy} (b) $\frac{a^y}{b^y}$ (c) $a^x b^x$

Exercise 1.3, Page 11

5. (a) 10^3 (f) 2^{-1}
 (b) 3^2 (g) $(-7)^{-2}$ or 7^{-2}
 (c) $9x^{-1}$ (h) $(-2)^3$ or -2^3
 (d) 1 (i) $\left(\frac{2}{3}\right)^{-1}$
 (e) 3
7. (a) 3 (e) 1
 (b) 1 (f) $-3t$
 (c) r^{-5} (g) 5^2
 (d) 1 (h) $2x^{10}$
8. (a) 20 (d) 2
 (b) 2 (e) 200
 (c) 30

9. (a) 3600 (d) 9×10^7
 (b) 10^{-2} or 0.01 (e) 0.0034
 (c) 10^{-2} or 0.01 (f) 10

Exercise 1.4, Page 15

6. (a) 2 (i) 3 (q) 125
 (b) 6 (j) 3 (r) 4
 (c) 2 (k) 64 (s) 4
 (d) 3 (l) 27 (t) -1
 (e) 4 (m) 5 (u) 7
 (f) 1000 (n) 2 (v) 11
 (g) 3 (o) 6 (w) 256
 (h) 7 (p) -1 (x) 25

Exercise 1.5, Page 17

5. (a) 1.3×10^3 (e) 1.1×10
 (b) 5×10^{-3} (f) 5.4×10^5
 (c) 2.4×10^{12} (g) 1
 (d) 2.5×10^4 (h) 1.6×10^{-12}

Exercise 1.6, Page 20

1. (a) $10^{0.034}$ (e) $10^{0.953}$
 (b) $10^{0.727}$ (f) $10^{0.299}$
 (c) $10^{0.539}$ (g) $10^{0.783}$
 (d) $10^{0.850}$ (h) $10^{0.464}$
2. (a) 36.22 (e) 3214
 (b) 0.4103 (f) 3.357×10^7
 (c) 5.082×10^{-6} (g) 5.408×10^5
 (d) 2009 (h) 2.917×10^{-10}
3. (a) 3.715 (f) 4130
 (b) 3.828×10^{-5} (g) 41 210
 (c) 3.404 (h) 4.977×10^{-8}
 (d) 5.623×10^{-4} (i) 91.62
 (e) 13.43 (j) 144.5

Exercise 2.1, Page 24

1. (a) $13x$ (h) $3a - 3b$
 (b) $9m$ (i) $-3m - 3n$
 (c) $6a$ (j) $4x + 5y$
 (d) $14r$ (k) $3x^2 - 2x$
 (e) $6c + 4d$ (l) $2m^2 + m$
 (f) $x + 8y$ (m) $6a^2 + 5a - 7$
 (g) $e - 2f$ (n) $7r^2 - 2r$

2. (a) $6ab$ (i) $-50d$
 (b) $6mn$ (j) $24a^3b^4$
 (c) $10xy$ (k) $25a^2b^{10}$
 (d) $-10rs$ (l) $32x^3y^4$
 (e) $-6cd$ (m) $-12r^3s^4$
 (f) $14m^2n^2$ (n) $-21m^3$
 (g) $22m^3n^2$ (o) 42
 (h) $12a^3b^3$ (p) $-24x^5$
3. (a) $10x + 5y$ (e) $3ab + 2ac$
 (b) $21a - 28b$ (f) $-6rs + 15r$
 (c) $6x^2 - 4xy$ (g) $15x^3 - 6x^2 + 21x$
 (d) $8m^2 - 12m$ (h) $-14c^3 + 4c^2 - 8c$
4. (a) $3x^2 - 2x - 6$ (d) $2m^3 + m^2 + m +$
 (b) $4m^2$ (e) $6a^2b - 9ab$
 (c) $9t^2 - 21t$ (f) $-7c^3d^2 - 9c^2d^3$

Exercise 2.2, Page 26

1. (a) $x^2 + 5x + 6$ (j) $3n^2 + 4n - 15$
 (b) $c^2 - 2c - 8$ (k) $2x^2 - xy - 6y^2$
 (c) $d^2 + 2d - 15$ (l) $15m^2 - mn - 2n^2$
 (d) $y^2 - 6y + 8$ (m) $2a^2 - 5a + 3$
 (e) $4x^2 + 15x - 4$ (n) $2t^2 + 7t - 15$
 (f) $6f^2 - 4f - 10$ (o) $15m^2 - 8m - 12$
 (g) $2y^2 + 9y - 35$ (p) $6c^2 - 19cd - 7d^2$
 (h) $14a^2 - 31a - 10$ (q) $3b^2 - 5bc - 2c^2$
 (i) $6m^2 + 7m - 10$ (r) $3x^2 - 16xy - 35y^2$
2. (a) $x^2 + 9x + 18$ (b) $2x^2 + 5x + 2$
3. (a) $3x^2 - 4x - 11$ (k) $8y^2 + 12y - 11$
 (b) $2a^2 - 4a - 12$ (l) $14m^2 - 15m - 6$
 (c) $5c^2 - 12c - 19$ (m) $43c^2 - 21c + 9$
 (d) $3m^2 + 3$ (n) $7e^2 - 5e + 11$
 (e) $3t^2 - 13t + 13$ (o) $10n - 21$
 (f) $-x^2 + 10x - 10$ (p) $2r^2 + 25r - 3$
 (g) $4d^2 - 4d - 5$ (q) $50x^2 + 20x$
 (h) $-2x^2 + 16x + 43$ (r) $12xy - 8x^2$
 (i) $4t^2 - 4t - 17$ (s) $-3a^2 - 5ac - 7c^2$
 (j) $8c^2 + 6cd - 25d^2$ (t) $12z^2 + 10z - 24$

Exercise 2.3, Page 28

1. (a) x (e) $-a + 2$ (i) $x + 1$
 (b) b (f) $mn - 2$ (j) $a - 2b$
 (c) $7x$ (g) $-3a + 1$ (k) $m + 2n$
 (d) $b + c$ (h) $9a^2 - 3$ (l) $x - 3y$

2. (a) $x + 4$ (e) $x - 2$
 (b) $x + 3$ (f) $3m + 1$
 (c) $x + 2$ (g) $x^2 - 5x + 1$
 (d) $x - 2$ (h) $3x^2 - 5x + 1$
3. No.
4. -4 6. $2m^2 - m - 3$
5. $a^2 - a - 1$ 7. $2x^3 - 11x^2 + 15x - 6$

Exercise 2.4, Page 29

3. (a) $a^2 + 2ab + b^2$ (m) $25x^2 - 30x + 9$
 (b) $x^2 - 4x + 4$ (n) $4z^2 - 36z + 81$
 (c) $4y^2 + 20y + 25$ (o) $9x^2 - 24xy + 16y^2$
 (d) $9z^2 - 6z + 1$ (p) $36p^2 - 48pq + 16q^2$
 (e) $9c^2 - 24c + 16$ (q) $36d^2 + 84de + 49e^2$
 (f) $25x^2 - 20xy + 4y^2$ (r) $9c^2 - 12cd + 4d^2$
 (g) $9x^2 + 6x + 1$ (s) $9a^2 - 30ab + 25b^2$
 (h) $49m^2 - 28mn + 4n^2$ (t) $4e^2 + 12ef + 9f^2$
 (i) $25a^2 + 20ab + 4b^2$ (u) $16f^2 + 16fq + 4q^2$
 (j) $p^2 - 4pq + 4q^2$ (v) $49 + 56r + 16r^2$
 (k) $16m^2 + 8m + 1$ (w) $16m^2 - 72m + 81$
 (l) $9t^2 - 12tr + 4r^2$ (x) $49e^2 - 28ef + 4f^2$

Exercise 2.5, Page 31

4. (a) $x^2 - 16$ (g) $9x^2 - 64y^2$
 (b) $y^2 - 49$ (h) $36q^2 - 25r^2$
 (c) $4x^2 - 25y^2$ (i) $16 - q^2$
 (d) $9m^2 - 25$ (j) $25 - 4q^2$
 (e) $z^2 - 4q^2$ (k) $36 - t^2$
 (f) $4t^2 - 49$ (l) $49c^2 - 4e^2$
5. (a) $4x^2 - 9$ (h) $16x^2 - 25$
 (b) $9x^2 - 4$ (i) $49x^2 - 4y^2$
 (c) $25x^2 - 49y^2$ (j) $9x^2 - 1$
 (d) $x^2 - 100y^2$ (k) $49x^2 - y^2$
 (e) $4a^2 - 25$ (l) $36x^2 - 25y^2$
 (f) $9m^2 - 4n^2$ (m) $4m^2 - n^2$
 (g) $4c^2 - 9y^2$ (n) $9x^2 - 4c^2$

Exercise 2.6, Page 32

1. (a) x^3, y^3 (e) $r^3, 8s^3$ (i) $8v^3, w^3$
 (b) $8m^3, n^3$ (f) $c^3, -27$ (j) $27x^3, -8$
 (c) $a^3, -8$ (g) $8r^3, -s^3$ (k) $d^3, -8$
 (d) $27x^3, 8y^3$ (h) $8a^3, -b^3$ (l) $125a^3, 64c^3$

2. (a) $3x^2y$ (e) $-36e^2f$ (i) $12x^2y$
 (b) $12a^2b$ (f) $-6y^2z$ (j) $75m^2n$
 (c) $-6m^2$ (g) $-27c^2d$ (k) $-12d^2e$
 (d) $-12t^2u$ (h) $-9m^2$ (l) $-9r^2s$
3. (a) $3xy^2$ (e) $12ab^2$ (i) $6ef^2$
 (b) $3xy^2$ (f) $12ef^2$ (j) $12a$
 (c) $12m$ (g) $54p$ (k) $9rs^2$
 (d) $27ab^2$ (h) $54t$ (l) $9mn^2$
4. (a) $x^3 + 3x^2y + 3xy^2 + y^3$
 (b) $a^3 - 3a^2b + 3ab^2 - b^3$
 (c) $8a^3 + 12a^2b + 6ab^2 + b^3$
 (d) $a^3 - 6a^2 + 12a - 8$
 (e) $x^3 - 9x^2y + 27xy^2 - 27y^3$
 (f) $8x^3 + 12x^2y + 6xy^2 + y^3$
 (g) $27a^3 + 27a^2b + 9ab^2 + b^3$
 (h) $8r^3 - 12r^2s + 6rs^2 - s^3$
 (i) $a^3 - 9a^2 + 27a - 27$
 (j) $27y^3 + 27y^2z + 9yz^2 + z^3$
 (k) $8p^3 - 36p^2q + 54pq^2 - 27q^3$
 (l) $m^3 - 9m^2n + 27mn^2 - 27n^3$
 (m) $c^3 - 6c^2d + 12cd^2 - 8d^3$
 (n) $8c^3 + 36c^2 + 54c + 27$
 (o) $8m^3 + 12m^2n + 6mn^2 + n^3$
 (p) $8f^3 - 12f^2g + 6fg^2 - g^3$
 (q) $e^3 - 6e^2f + 12ef^2 - 8f^3$
 (r) $8m^3 - 12m^2n + 6mn^2 - n^3$
 (s) $f^3 + 6f^2g + 12fg^2 + 8g^3$
 (t) $27p^3 - 135p^2 + 225p - 125$
 (u) $125x^3 - 75x^2y + 15xy^2 - y^3$
 (v) $x^3 + 15x^2y + 75xy^2 + 125y^3$
 (w) $8q^3 + 36q^2f + 54qf^2 + 27f^3$
 (x) $64f^3 - 48f^2e + 12fe^2 - e^3$
 (y) $e^3 + 9e^2 + 27e + 27$
 (z) $125x^3 - 150x^2y + 60xy^2 - 8y^3$

Exercise 3.1, Page 38

1. (a) $3, (x + y)$ (l) $2mn, (m^2 + 2n^2 + 3)$
 (b) $7, (m - n)$ (m) $3, (a + 2b + c)$
 (c) $5, (a - b)$ (n) $5x, (1 - 3x)$
 (d) $2, (c - d + e)$ (o) $2, (y - 2z)$
 (e) $5, (2a - b)$ (p) $3e, (e - 5)$
 (f) $7, (p - 2q)$ (q) $7xy, (x + 2y)$
 (g) $3a, (a + b)$ (r) $3b, (4a + c)$
 (h) $5x, (x + y)$ (s) $9m, (3mn - 1)$
 (i) $8m^2, (m + 2n)$ (t) $16b, (a^2 + 2bc)$
 (j) $11e^2, (e + 2f)$ (u) $35c, (ab + 2b + 3a)$
 (k) $3x^2y, (2 + 3xy)$ (v) $14mn^2, (m^2 - 2)$

2. (a) $x(x + 3)$ and $-2(x + 3)$

(b) $(x + 3)$

(c) $(x - 2)$

3. (a) $(a + b)(5 + 3c)$ (e) $(m - 2n)(2p - 3q)$

(b) $(a + b)(x + y)$ (f) $(3c - 1)(2a - b)$

(c) $(a - b)(2x - 3y)$ (g) $(3a + 2b)(4r - 3s)$

(d) $(2r - 1)(3x + 2y)$ (h) $(2z - m)(7x + 1)$

Exercise 3.2, Page 39

2. (a) $2(a + 3)(a - 3)$ (m) $(2m + 3)(2m - 3)$

(b) $3(m + 5)(m - 5)$ (n) $4(m + 2)(m - 2)$

(c) $2(c + 2)(c - 2)$ (o) $5(x + 5)(x - 5)$

(d) $5(x + 2)(x - 2)$ (p) $r(s + 3)(s - 3)$

(e) $3(b + 2)(b - 2)$ (q) $16(t + 2)(t - 2)$

(f) $5m(m + 3n)(m - 3n)$ (r) $(c + 7)(c - 7)$

(g) $a(b + 1)(b - 1)$ (s) $3(d + 7)(d - 7)$

(h) $4(x + 2)(x - 2)$ (t) $7(e + 3)(e - 3)$

(i) $6(t + 3)(t - 3)$ (u) $3(3 + m)(3 - m)$

(j) $(7 + m)(7 - m)$ (v) $3a(2 + 3a)(2 - 3a)$

(k) $(6 + b)(6 - b)$ (w) $(a + 1)(a - 1)$

(l) $2(6 + t)(6 - t)$ (x) $25(5x + 1)(5x - 1)$

3. (a) $(x + 4)(x - 4)$ (h) $(a + 9)(a - 5)$

(b) $(x + 2)(x - 6)$ (i) $(b + 8)(b - 2)$

(c) $(m + 5)(m - 5)$ (j) $(x + y + 1)(x - y + 5)$

(d) $(m + 8)(m - 2)$ (k) $(t + r - 1)(t - r - 5)$

(e) $(5x + 3)(5x - 3)$ (l) $c(c + 4)$

(f) $(8 + x)(2 - x)$ (m) $(m + n + 1)(m - n + 5)$

(g) $(13 + y)(1 - y)$ (n) $(10 + f)(2 - f)$

Exercise 3.3, Page 41

6. (a) $(a + 2)^2$ (n) $(n + 3p)^2$

(b) $7(b + 2)^2$ (o) $5(a + 2)^2$

(c) $(c - 3)^2$ (p) $4(2p - 3)^2$

(d) $3(d + 3)^2$ (q) $3(q + 6)^2$

(e) $(e + 1)^2$ (r) $3(4r + 3t)^2$

(f) $11(f - 3)^2$ (s) $(5s - 2f)^2$

(g) $(g + 5h)^2$ (t) $2(t - 7)^2$

(h) $(h + 25)^2$ (u) $10u(u - 1)^2$

(i) $2(i + 4t)^2$ (v) $(2v - 13)^2$

(j) $2(j + 12)^2$ (w) $(w - 9)^2$

(k) $k(k - 7)^2$ (x) $(7x + 2)^2$

(l) $3k(k - 4)^2$ (y) $(2y + 11)^2$

(m) $n(m - 2)^2$ (z) $(9z + 1)^2$

Exercise 3.4, Page 44

5. (a) $(x + y)(2a + 3b)$

(b) $(a + 2)(x - y)$

(c) $(m + n)(2m - 1)$

(d) $(2x + 3)(x - y)$

(e) $(m + 1)(y - 3)$

(f) $(2m + 3)(m - n)$

(g) $(s - 1)(t - 3)$

(h) $(3 - y)(2 - x)$

(i) $(2x - 3)(x - y + z)$

(j) $(5a - 1)(m - n - 1)$

(k) $(x - y)(2x^2 - 3x - 3)$

(l) $(a + 1)(c^2 + 3b - 3)$

6. (a) $(c + 2d + 2)(c + 2d - 2)$

(b) $(a + 3b + 3)(a + 3b - 3)$

(c) $(f - 2g + 1)(f - 2g - 1)$

(d) $(2m + n + 5)(2m + n - 5)$

(e) $(2c - 3d + 3)(2c - 3d - 3)$

(f) $(5 + a - b)(5 - a + b)$

(g) $(4x + y + 7)(4x + y - 7)$

(h) $(2a + b + 2)(2a + b - 2)$

(i) $(9x + y + 2)(9x + y - 2)$

(j) $(f - 2h + 1)(f - 2h - 1)$

Exercise 3.5, Page 46

2. (a) $(x + 2)(x + 5)$ (n) $(x + 5)^2$

(b) $(x - 12)(x - 2)$ (o) $(y - 7)^2$

(c) $(a + 2)(a - 5)$ (p) $5(r + 5)(r + 6)$

(d) $(b - 2)^2$ (q) $2(a + 6)^2$

(e) $(m + 4)(m - 2)$ (r) $(t + 8)(t - 6)$

(f) $(x + 6)(x + 3)$ (s) $n(m + 2)(m - 3)$

(g) $(p - 3)^2$ (t) $y(x - 4)^2$

(h) $a(x + 7)(x - 3)$ (u) $(a + 7)(a + 6)$

(i) $(c + 2)(c - 7)$ (v) $z(z + 5)(z - 7)$

(j) $2(d + 6)(d + 5)$ (w) $(y + 7)(y - 1)$

(k) $(s + 6)(s - 2)$ (x) $(m - 11)^2$

(l) $(e + 4)(e - 7)$ (y) $(x + 8)(x - 5)$

(m) $3(n + 9)(n - 8)$ (z) $(n + 27)(n - 3)$

3. (a) $(3a - 1)(a + 2)$ (c) $(10x - 7)(x + 3)$

(b) $(4b + 1)(2b + 3)$ (d) $(6r - 1)(r - 5)$

4. (a) $(2x + 1)(x + 3)$ (f) $(5a - 2)(a - 1)$

(b) $(2r - 1)(r + 3)$ (g) $(5q + 1)(q - 2)$

(c) $(3x - 7)(x + 1)$ (h) $(7c + 2)(c - 1)$

(d) $(3s + 1)(s + 7)$ (i) $(7c - 1)(c + 2)$

(e) $(5a - 1)(a - 2)$ (j) $(5x - 3)(x - 1)$

5. (a) $3(t+2)(t-1)$ (f) $(5c-4)(c+1)$
 (b) $(t+3)(5t-3)$ (g) $(2a+1)(3a-7)$
 (c) $(3r+1)(r-6)$ (h) $(3x+1)(x+8)$
 (d) $(x+1)(9x-1)$ (i) $(3a-4)(a-2)$
 (e) $3(4y+1)(y+1)$ (j) $(5r+2)(r-2)$
6. (a) $(4x+5)(2x+3)$ (f) $(2x+3)(5x-2)$
 (b) $(3c+4)(2c-1)$ (g) $2(2s+3)(3s-2)$
 (c) $(3r+2)(2r-3)$ (h) $(3a-4)^2$
 (d) $(7t-3)(2t-3)$ (i) $(2t+5)(7t-3)$
 (e) $(2y+3)^2$ (j) $(4x-5)(2x-3)$

Exercise 3.6, Page 49

2. (a) $(a+2b)(a^2-2ab+4b^2)$
 (b) $(2r+3s)(4r^2-6rs+9s^2)$
 (c) $(5x+y)(25x^2-5xy+y^2)$
 (d) $(3c+1)(9c^2-3c+1)$
 (e) $(4m+3)(16m^2-12m+9)$
 (f) $(2t+1)(4t^2-2t+1)$
3. (a) $(a-2b)(a^2+2ab+4b^2)$
 (b) $(x-4)(x^2+4x+16)$
 (c) $(5e-1)(25e^2+5e+1)$
 (d) $(b-1)(b^2+b+1)$
 (e) $(2m-3n)(4m^2+6mn+9n^2)$
 (f) $(2e-5)(4e^2+10e+25)$
4. (a) $(m-5)(m^2+5m+25)$
 (b) $(a+3b)(a^2-3ab+9b^2)$
 (c) $(2b-5)(4b^2+10b+25)$
 (d) $(2x-1)(4x^2+2x+1)$
 (e) $(3d+5)(9d^2-15d+25)$
 (f) $(5e-2)(25e^2+10e+4)$
5. (a) $2(a-2b)(a^2+2ab+4b^2)$
 (b) $3(x+y)(x^2-xy+y^2)$
 (c) $3(m-2n)(m^2+2mn+4n^2)$
 (d) $4(2t-1)(4t^2+2t+1)$
 (e) $7(b-2)(b^2+2b+4)$
 (f) $5(f+2)(f^2-2f+4)$

Exercise 4.1, Page 56

3. (a) $\frac{1}{2}$ (d) $\frac{2}{7}$
 (b) 5 (e) $\frac{2}{3}$
 (c) $\frac{2}{3}$ (f) -1
4. (a) 1 (c) $\frac{x+3}{x}$
 (b) $(x+2)$ (d) $\frac{a-3}{a}$

5. (a) 2 (d) -1
 (b) $\frac{1}{9}$ (e) $\frac{3}{4}$
 (c) $-\frac{8}{9}$ (f) $-\frac{4.5}{2}$
6. (a) $2x$
 (b) $\frac{3}{x}$
 (c) $3x^2$ (e) $\frac{2}{3}$
 (d) $\frac{10+2a}{2-a}$ (f) $\frac{c^2+4c+4}{c^2+2c+1}$
7. (a) 14 (d) 3
 (b) 2 (e) $\frac{7}{2}$
 (c) $\frac{3}{2}$ (f) 2
8. (a) $\frac{9}{5a}$ (d) 1
 (b) $\frac{6e^2+2e}{2e+1}$ (e) $\frac{f-3}{f-1}$
 (c) $\frac{1}{3}$
9. (a) 6 (d) 27
 (b) $\frac{10}{7}$ (e) 6
 (c) 6 (f) $\frac{11}{3}$
10. (a) $\frac{d+1}{d-5}$
 (b) $\frac{1}{y+3}$ (d) $\frac{c+4}{c}$
 (c) $\frac{1}{2x}$ (e) $\frac{1}{m+7}$
11. (a) 462 (e) 12
 (b) $\frac{1}{2}$ (f) 1
 (c) 9 (g) 3
 (d) $\frac{7}{4}$ (h) 9
12. (a) $\frac{x}{5x-1}$ (d) $\frac{m^2+5}{m+5}$
 (b) $\frac{2a+1}{a}$ (e) $\frac{(y-3)(3y+1)}{(y-9)(3y-1)}$
 (c) 1 (f) 1
13. $\pi(m+n)^2(2m-n)$

Exercise 4.2, Page 61

4. (a) 60
 (b) 60
 (c) $(x+5)^2(x-5)$
 (d) $x(x+1)(x+3)$

- (e) $x(x+2)(x-2)$
 (f) $x(x-3)(x-2)(x+2)$
 (g) $(x+7)(x+1)(x-2)$
 (h) $(x-7)(x+7)(x+1)(x-1)$

5. (a) $\frac{25}{36}$ (e) $\frac{1}{15}$
 (b) $\frac{17}{60}$ (f) $\frac{-(x+15)}{(x-5)^2(x+5)}$
 (c) $\frac{3x+8}{x(x+1)}$ (g) $\frac{12x-9}{(x+2)(x+1)(x-2)}$
 (d) $\frac{31}{60}$ (h) $\frac{5x+7}{(x+1)(x+2)}$

6. (a) $\frac{17x-8}{36}$ (f) $\frac{x^2+25}{(x-5)(x+5)}$
 (b) -1 (g) $\frac{-60x}{(3x+5)(3x-5)}$
 (c) $\frac{64x+11y}{15}$ (h) $\frac{x^2-12x+8}{(3x+2)(3x-2)}$
 (d) $\frac{13x-13}{6}$ (i) $\frac{2x^2+15x+3}{(2x-3)(2x+3)}$
 (e) $\frac{3x}{x+2}$ (j) $\frac{28x^2-3x-3}{(4x+1)(4x-1)}$

7. (a) 15 (c) $\frac{1}{6}$ (e) $\frac{5}{4}$ (g) $\frac{1}{3}$
 (b) $\frac{1}{4}$ (d) $\frac{2}{3}$ (f) $\frac{1}{2}$ (h) $\frac{1}{2}$

8. (a) $\frac{67a}{60}$ (f) $\frac{-10b}{(a-b)(a+b)}$
 (b) $\frac{-y^2+5y+6}{(y-4)(y+4)}$ (g) $\frac{13r+10}{12}$
 (c) $\frac{3}{x(x+3)}$ (h) $\frac{8}{(x+1)(x-1)}$
 (d) $\frac{-33m-62}{70}$ (i) $\frac{-x^2+5x+2}{(x-1)(x+1)}$
 (e) $\frac{3}{x+1}$ (j) $\frac{2}{(y-4)(y-6)}$

9. (a) 83.4 cm (b) 22.8 cm
 10. (a) $\frac{11}{18}$ (b) $\frac{11}{14}$ (c) $\frac{374}{225}$ (d) $\frac{495}{224}$

Exercise 4.3, Page 64

2. (a) 2, 4 (f) 1, 2
 (b) -1, 4 (g) 0, 6
 (c) 2, -4 (h) 5, -4
 (d) 5, -13 (i) -2, -5
 (e) -10, 3 (j) 9, -9

3. (a) 9, -1 (f) -3, 5
 (b) -16, 4 (g) 2, 4
 (c) -3, 11 (h) -3, 4
 (d) 3, 5 (i) -16, 4
 (e) -10, 3 (j) -5, 5

4. (a) -6, -5 (d) 0, 5
 (b) -9, 7 (e) -3, 2
 (c) 0, 8 (f) -1, 4

5. 1 cm $\times$ 7 cm
 6. 8 and 9 or -8 and -9 9. 12 and 14
 7. 12 cm and 16 cm 10. 17 m $\times$ 47 m
 8. 3 m 11. 40 cm $\times$ 24 cm
 12. 19 and 21 or -21 and -19

Exercise 5.1, Page 68

1. (a) (b) (d) (f) (h)
 2. (a) 5 (f) $\sqrt{2}$
 (b) 2 (h) 17
 (d) 13
 4. 6 m
 5. (a) 6.71 (c) 7.74 (e) 3.16
 (b) 17.00 (d) 5.00 (f) 12.00
 6. No 7. Yes

Exercise 5.2, Page 72

1. (a) 6.481 (f) 502.02
 (b) 5.477 (g) 32.862
 (c) 9.165 (h) 125.505
 (d) 30.984 (i) 27.111
 (e) 56.13 (j) 17.748
 2. (a) $\frac{1}{2}$ (c) $\sqrt{6}$ (e) $\frac{1}{\sqrt{3}}$
 (b) $\frac{2}{3}$ (d) $\sqrt{10}$ (f) $\sqrt[4]{\frac{6}{35}}$

3. (a) 2.646 (e) 4.898 (i) 2
 (b) 1.732 (f) 6.708 (j) 2.449
 (c) 2.828 (g) 6.708
 (d) 0.745 (h) 0.866

4. (a) $\frac{8}{5}$ (c) 20 (e) $\frac{21}{4}$
 (b) 2 (d) $\frac{3}{2}$ (f) $\frac{1}{5}$

Exercise 5.3, Page 73

4. (a) $5\sqrt{2}$ (f) $28\sqrt{3}$ (k) $21\sqrt{5}$
 (b) $6\sqrt{2}$ (g) $6\sqrt{2}$ (l) $12\sqrt{5}$
 (c) $6\sqrt{3}$ (h) $4\sqrt{3}$ (m) $40\sqrt{2}$
 (d) $9\sqrt{2}$ (i) $15\sqrt{3}$ (n) $30\sqrt{5}$
 (e) $20\sqrt{2}$ (j) 64 (o) 99
5. (a) $2\sqrt{2}$ (f) $8\sqrt{2} - 5\sqrt{3}$
 (b) $4\sqrt{3}$ (g) $4\sqrt{6}$
 (c) $\sqrt{2}$ (h) $31\sqrt{3} - 15\sqrt{2}$
 (d) $27\sqrt{2}$ (i) $-9\sqrt{7}$
 (e) $6\sqrt{5}$ (j) $-31\sqrt{11}$
6. (a) $a\sqrt{b}$ (f) $c^2d\sqrt{c}$ (k) $x^2y\sqrt{xy}$
 (b) $xy\sqrt{y}$ (g) $abc\sqrt{bc}$ (l) $a^2b^2\sqrt{b}$
 (c) $m\sqrt{m}$ (h) $mn^2\sqrt{mn}$ (m) $b^2c^2\sqrt{c}$
 (d) $pq\sqrt{p}$ (i) $b^3d^3\sqrt{b}$ (n) $pq^3\sqrt{q}$
 (e) $rs\sqrt{rs}$ (j) $m^3n^2\sqrt{n}$ (o) $m^3n^3\sqrt{n}$
7. (a) $3ab\sqrt{a}$ (d) $2a^3b^2\sqrt{b}$
 (b) $m^3n^2\sqrt{mn}$ (e) $4x^4y^3\sqrt{xy}$
 (c) $4p^8q^6\sqrt{q}$ (f) $-c^2d\sqrt{cd}$

Exercise 5.4, Page 75

3. (a) 3 (d) 2
 (b) 3 (e) -4
 (c) 22 (f) 18
4. (a) 20 (f) 18 (k) 135 (p) -3
 (b) -13 (g) 6 (l) 142 (q) -9
 (c) 3 (h) -21 (m) -8 (r) 71
 (d) -20 (i) 163 (n) 22
 (e) -12 (j) 8 (o) 35
5. 0.7746 6. 0.7746
7. (a) $\frac{\sqrt{6}}{2}$ (d) $2\sqrt{21}$ (g) $\frac{\sqrt{30}}{2}$
 (b) $\frac{5}{2}\sqrt{6}$ (e) $\frac{5}{6}\sqrt{15}$ (h) $3\sqrt{22}$
 (c) $9\sqrt{6}$ (f) $5\sqrt{21}$
8. 8.516 9. 8.517
10. (a) $\sqrt{5} + \sqrt{2} = 3.65$
 (b) $5(2\sqrt{3} - \sqrt{5}) = 6.14$
 (c) $2(2\sqrt{7} + \sqrt{3}) = 14.048$
 (d) $2(3 - \sqrt{2}) = 3.172$
 (e) $\frac{\sqrt{3}}{3}(\sqrt{7} + 2) = 2.682$
 (f) $\frac{\sqrt{5}}{8}(\sqrt{11} + \sqrt{3}) = 1.411$

- (g) $3\sqrt{3}(2\sqrt{5} - \sqrt{13}) = 4.500$
 (h) $-\sqrt{2}(\sqrt{14} + 3) = -9.533$
 (i) $\frac{5\sqrt{3}}{3}(4 - \sqrt{7}) = 3.909$
 (j) $-\sqrt{2}(\sqrt{13} + \sqrt{6}) = -8.562$

11. (a) $\frac{4\sqrt{5}}{5}$ (f) $\frac{24 + 4\sqrt{15}}{7}$
 (b) $\frac{\sqrt{30}}{5}$ (g) $4(2\sqrt{5} + 3\sqrt{2})$
 (c) $-2(\sqrt{3} + \sqrt{5})$ (h) $\frac{3\sqrt{7}}{7}$
 (d) $\frac{1}{2}(2\sqrt{3} - \sqrt{2})$ (i) $\frac{7\sqrt{5}}{10}$
 (e) $\frac{3\sqrt{14}}{7}$ (j) $\frac{\sqrt{5}(12\sqrt{3} + 4\sqrt{7})}{320}$

MBS Exercise 1, Page 79

1. (a) a^{10} (c) $24y^8$ (e) $24s^8$
 (b) $10b^5$ (d) $-12r^5$ (f) 5^{14}
2. (a) c^{-5} (c) $6g^2$ (e) $p^{\frac{5}{2}}$
 (b) f (d) $y^{\frac{2}{5}}$ (f) $125a^{12}$
3. (a) b^5 (c) $-6ab^4$ (e) $-3y^{10}$
 (b) $2d^3$ (d) p^6 (f) $6t^2$
4. (a) 1 (c) $\frac{4}{25}$
 (b) $\left(\frac{e}{4d}\right)^4$ (d) $\frac{a^{11}}{b^{11}}$
5. (a) 8.0×10^{14} (c) 4.0×10^{-3}
 (b) 10.2×10^2 (d) 8.4×10^9
6. (a) 4 (d) 9 (g) -2
 (b) 1 (e) 1 (h) $\frac{5}{4}$
 (c) $\frac{1}{81}$ (f) $\frac{1}{4}$ (i) $\frac{2}{5}$
7. (a) $4x^2$ (c) $\frac{1}{8y^2}$ (e) $\frac{1}{10n^2}$
 (b) $5a^2bc^3$ (d) $4m^2$ (f) $\frac{6p^4}{11r^3q^2}$
8. (a) 8×10^7 (d) 1.7×10^4
 (b) 1 (e) 2×10^{-1}
 (c) 9×10^{-6}
9. (a) 236 200 (d) 211 200
 (b) 2.585 (e) 72 560
 (c) 0.029 74 (f) 0.03

10. (a) $2y - y^2$ (c) $10y - 9$
 (b) $2g^2h + 6gh^2$ (d) $12p^2 - 50$
11. (a) $p^2 + 2p - 15$ (d) $6r^2 + 17r - 14$
 (b) $2x^2 - 19x + 35$ (e) $w^2 - 64$
 (c) $x^2 - 16x + 64$ (f) $49x^2 - 35x + 6$
12. (a) $q^3 - 27r^3$
 (b) $x^4 + 4x^3 + x^2 - 5x + 2$
 (c) $d^3 + 3d^2f + 3df^2 + f^3$
 (d) $x^3 - 7x^2 - 14x + 120$
13. (a) $-3c^2 + 2$ (d) $1 + 2pq$
 (b) $-k - 2$ (e) $2b - 3c + bc$
 (c) $2a + 4$ (f) $-d^2 - 2d + 1$
14. (a) $x^2 - 9$ (c) $x^2 - 4x - 3$
 (b) $x^2 + 2x$ (d) $x^2 - 4x + 6$
15. (a) $-18x + 18$ (d) $8y^2 - 37y - 16$
 (b) $y^2 + 10y - 14$ (e) $-2p^2 - 4p - 8$
 (c) $3a^2 - 8b^2$ (f) $-r^3 + 13r$
16. (a) $2p(3p - 1)$ (d) $(a + 2b)(k + 1)$
 (b) $5(m + 2)$ (e) $(x + y)(a + b + 3)$
 (c) $3k(k - 2)$ (f) $k(4k - y - z)$
17. (a) $(a + 3)(a - 3)$
 (b) $(b + 5)(b - 5)$
 (c) $4(c + 2)(c - 2)$
 (d) $(1 + 10w)(1 - 10w)$
 (e) $(a + b + c)(a + b - c)$
 (f) $(g + h - k)(g - h + k)$
18. (a) $(x - 5)(x - 3)$ (d) $(1 + 6x)(1 - 10x)$
 (b) $(y - 3)^2$ (e) $(a - 2b)^2$
 (c) $(t + 1)(t - 6)$ (f) $(7 + k)(1 + k)$
19. (a) $(r + t)(p + s)$
 (b) $(x + 2y)(3 - k)$
 (c) $(a + b)(a + b + 3)$
 (d) $(s - t)(s + t - 4)$
 (e) $(x - 5)(x^2 + 3)$
 (f) $(y + 4)(y + 1)(y - 1)$
20. (a) $3(p + 2)(p - 2)$
 (b) $3(m - 3)(m - 2)$
 (c) $(x^2 + 1)(x + 1)(x - 1)$
 (d) $3(p + 2)(p - 3)$
 (e) $5(2a - 1)(4a^2 + 2a + 1)$
 (f) $3(x - 4)^2$
21. (a) $\frac{1}{2}$ (e) xy^2z^2
 (b) $-\frac{5}{3}$ (f) $\frac{6c^2}{b^4}$
 (c) $\frac{p}{2}$ (g) $\frac{x}{x + 7}$
 (d) $-\frac{3b}{2}$ (h) $6a + 7b$
22. (a) $(3y - 5)$ (c) $(y - 1)$
 (b) $\frac{x - 2}{x}$
23. (a) $a - 3$ (c) $\frac{3(2a + b)}{2(2a - b)}$
 (b) 1 (d) 1
24. (a) $\frac{10}{3}$ (c) $\frac{b + 2}{2ab}$
 (b) $-\frac{53}{12}$ (d) $\frac{3d - 4c}{c^2d^2}$
25. (a) $\frac{7x + 23}{12}$ (d) $\frac{6y}{x - 2y}$
 (b) $\frac{y - 1}{18}$ (e) $\frac{2x - 11}{(x - 3)(x - 4)}$
 (c) $\frac{6a + 5b}{30}$ (f) $\frac{a + 3b}{a(a + b)(a - b)}$
26. (a) $7, -\frac{3}{2}$ (d) $5, 3$
 (b) $5, 2$ (e) $-\frac{1}{3}, 2$
 (c) $0, 7$ (f) $\frac{4}{5}, -\frac{4}{5}$
27. (a) $\sqrt{77}$ (d) $12\sqrt{30}$
 (b) 20 (e) $100\sqrt{42}$
 (c) 12 (f) prq
28. (a) $\sqrt{2}$ (d) $\sqrt[4]{\frac{2}{5}}$
 (b) $3\sqrt{5}$ (e) $\sqrt{y}$
 (c) $\frac{7\sqrt{3}}{6\sqrt{7}}$ (f) $2\sqrt[4]{\frac{hf}{ce}}$
29. (a) $2\sqrt{3}$ (d) $x^2y^2\sqrt{y}$
 (b) $3\sqrt{5}$ (e) $\frac{3}{2}$
 (c) $15\sqrt{7}$ (f) $\frac{55}{4}x$
30. (a) $7\sqrt{13}$
 (b) $6\sqrt{7} + 2\sqrt{5}$
 (c) $34\sqrt{3}$
 (d) $16\sqrt{5} + 10\sqrt{7}$
31. (a) $\sqrt{10} + \sqrt{15}$ (d) $2\sqrt{33} + 5\sqrt{11}$
 (b) $4\sqrt{6} + \sqrt{30}$ (e) $12\sqrt{10} - 28\sqrt{2}$
 (c) $\sqrt{14} + \sqrt{7}$ (f) $10\sqrt{15} + 15\sqrt{21}$

32. (a) $\sqrt{10} + \sqrt{12} + \sqrt{15} + \sqrt{18}$
 (b) 5
 (c) $11 + 2\sqrt{30}$
 (d) $6 - 2\sqrt{15} + 4\sqrt{3} - 4\sqrt{5}$
 (e) $34 + 23\sqrt{2}$
 (f) $\sqrt{42} + \sqrt{30} + \sqrt{14} + \sqrt{10}$
33. (a) 4
 (b) $7\sqrt{6} - 5\sqrt{14} + 4\sqrt{21} - 20$
 (c) $2\sqrt{5} + 5\sqrt{2} + 2\sqrt{3} + \sqrt{30}$
 (d) $30\sqrt{2} + 20\sqrt{15} - 60\sqrt{3} - 60\sqrt{10}$
34. (a) $\frac{\sqrt{77}}{11}$ (d) $\sqrt{26}$
 (b) $\frac{8\sqrt{42}}{7}$ (e) $\frac{2\sqrt{35}}{3}$
 (c) $\frac{7\sqrt{10}}{8}$ (f) $\frac{3\sqrt{170}}{14}$
35. (a) $\frac{\sqrt{7} + \sqrt{2}}{5}$ (d) $\sqrt{30} + \sqrt{15}$
 (b) $\frac{\sqrt{13} - 2}{9}$ (e) $10 - 4\sqrt{3}$
 (c) $\frac{8 - 2\sqrt{6}}{5}$ (f) $\frac{8\sqrt{15} + 6\sqrt{6}}{31}$
36. (a) 13 (c) 4
 (b) $\sqrt{34}$ (d) $\sqrt{21}$

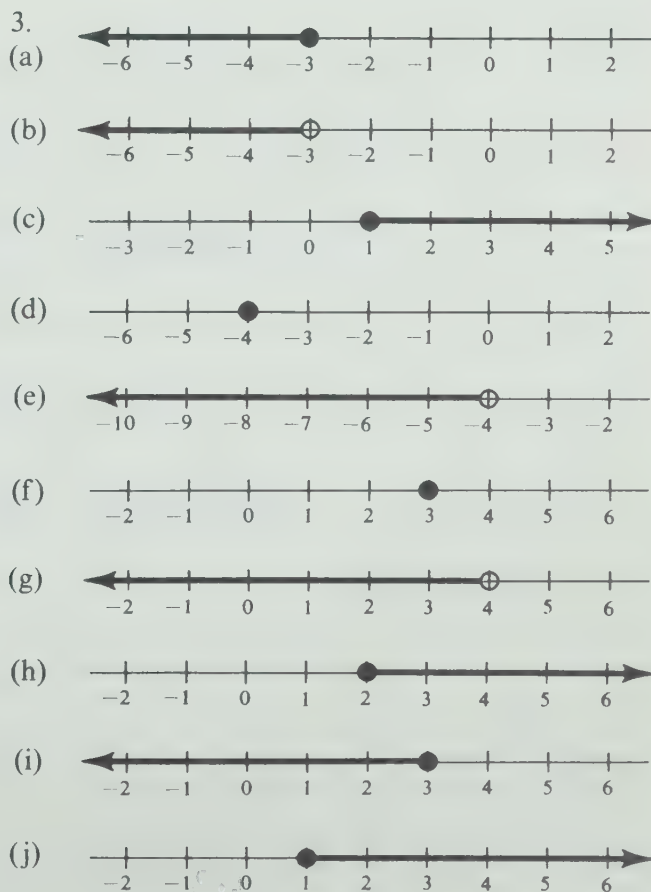
Exercise 6.1, Page 87

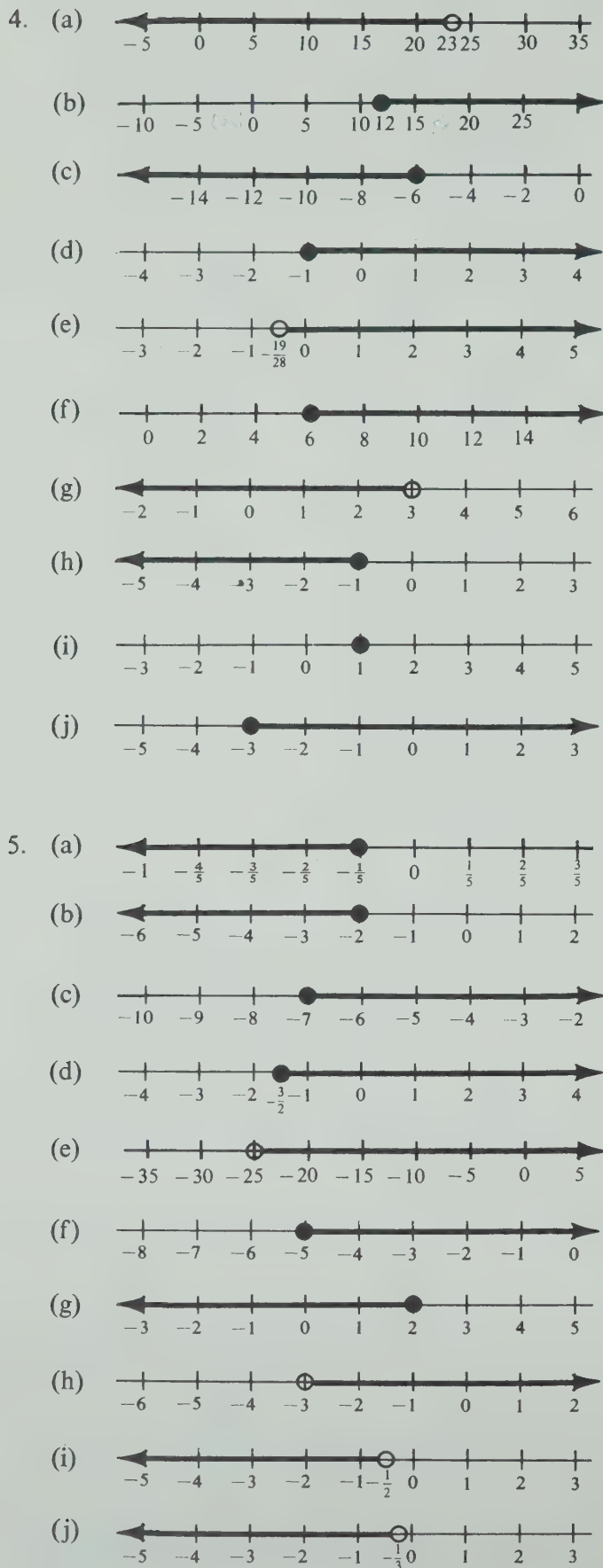
1. (a) 7 (d) 1 (g) -15
 (b) 9 (e) 3 (h) -1
 (c) 2 (f) -3 (i) $\frac{11}{9}$
 (j) $\frac{31}{2}$
2. (a) 1 (d) 5 (g) 4
 (b) 2 (e) 22 (h) $\frac{1}{3}$
 (c) -11 (f) 3 (i) 3
 (j) -1
3. (a) 20 (d) 8 (g) $-\frac{12}{13}$
 (b) $\frac{13}{6}$ (e) $\frac{2}{9}$ (h) $\frac{4}{5}$
 (c) $\frac{1}{2}$ (f) $\frac{8}{3}$ (i) 8
 (j) 1
4. (a) 2 (d) 1 (h) $\frac{1}{b}$
 (b) $\frac{3}{2}$ (e) 2 (i) 1
 (c) 1 (g) $\frac{1}{a}$ (j) 4

Exercise 6.2, Page 91

3. (a) $x \leq 1$ (f) $z < -\frac{15}{7}$
 (b) $a \geq -3$ (g) $x \leq -18$
 (c) $m \geq -3$ (h) $x > \frac{7}{2}$
 (d) $b \leq 6$ (i) $p < \frac{8}{13}$
 (e) $y < -4$ (j) $c \leq -6$
4. (a) $x \geq -3$ (f) $m \leq 3$
 (b) $a \leq 17$ (g) $c < -41$
 (c) $b \leq 20$ (h) $x > -8$
 (d) $x \geq -\frac{9}{2}$ (i) $a < 30$
 (e) $y \leq -5$
5. (a) $x < \frac{1}{2}$ (f) $e \leq -2$
 (b) $y > 32\frac{1}{2}$ (g) $x \leq -1$
 (c) $a > \frac{4}{7}$ (h) $\frac{7}{2}$
 (d) $a \leq 6$ (i) $x < \frac{15}{14}$
 (e) $m \geq 10$ (j) $a > -2$

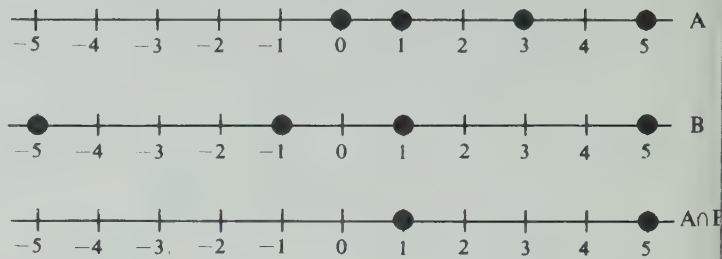
Exercise 6.3, Page 94



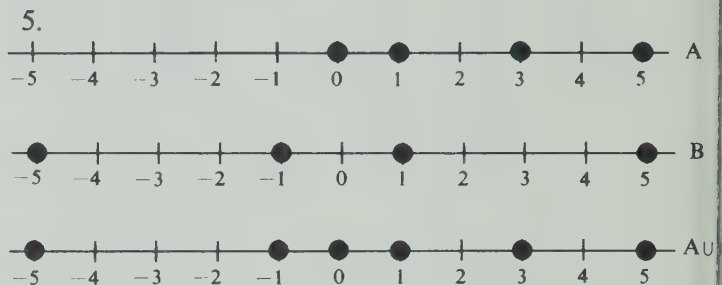


Exercise 6.4, Page 97

4. $A = \{5, 3, 1, 0\}$ $B = \{1, 5, -5, -1\}$



$A \cap B = \{1, 5\}$



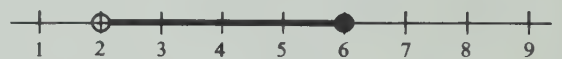
$A \cup B = \{-5, -1, 0, 1, 3, 5\}$

6. (a) $\{2, 4\}$ (b) $\{1, 2, 3, 4, 5, 7, 9, 11, -3\}$

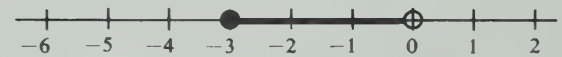
7. (a) ϕ (b) $\{-14, -11, -7, -4, 1, 3, 4, 6, 8, 11, 14\}$

8. $\{5, 6, 7, 8\}$

9. (a) $\{x | 2 < x \leq 6\}$



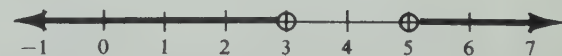
(b) $\{x | -3 \leq x < 0\}$



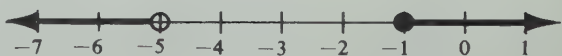
(c) $\{x | x > 2\}$



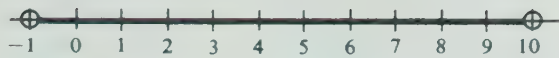
(d) $\{x | x < 3 \text{ or } x > 5\}$



(e) $\{x | x < -5 \text{ or } x \geq -1\}$



(f) $\{x | -1 < x < 10\}$



(g) $\{x | x \geq -1\}$



(h) $\{x | x \leq 1\}$

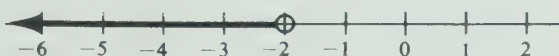


(i) ϕ

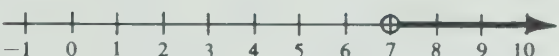
(j) $\{x | x < 0 \text{ or } x \geq 2\}$



(k) $\{x | x < -2\}$



(l) $\{x | x > 7\}$



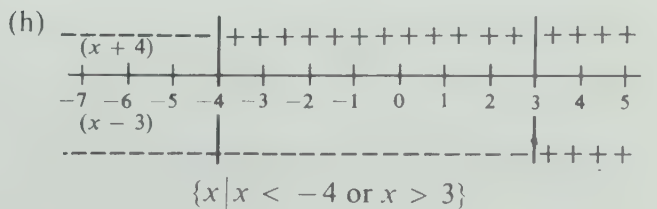
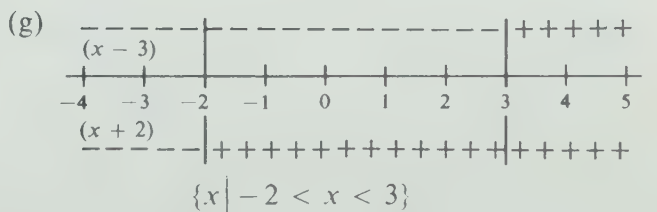
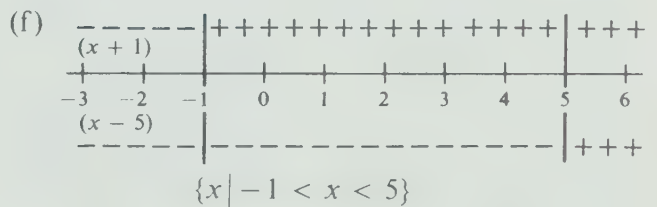
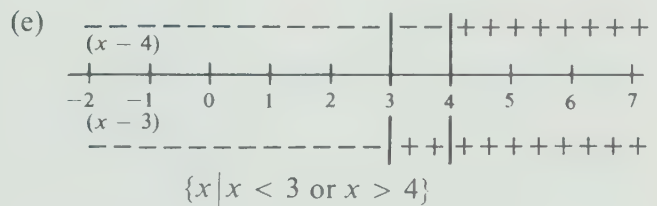
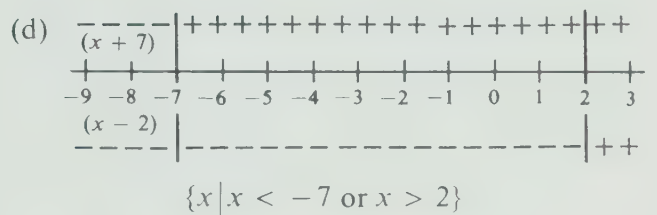
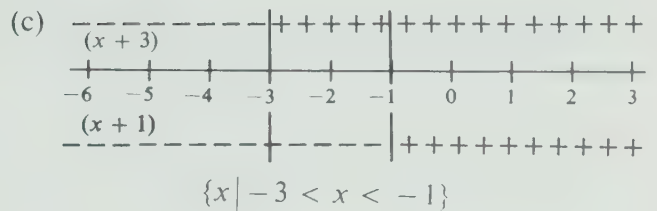
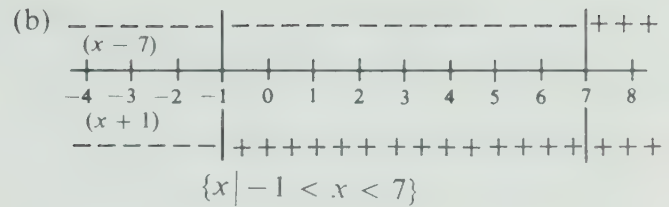
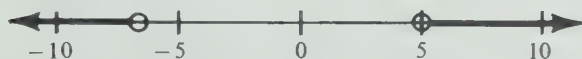
(m) $\{x | x \leq 3\}$



(n) ϕ

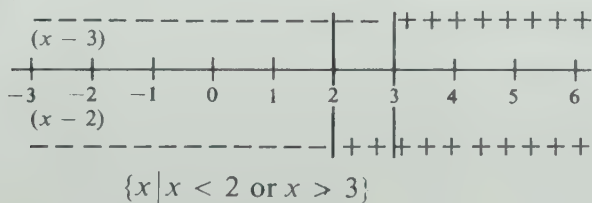
(o) ϕ

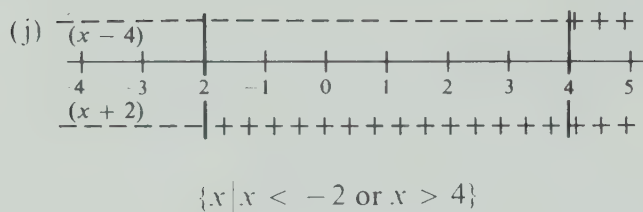
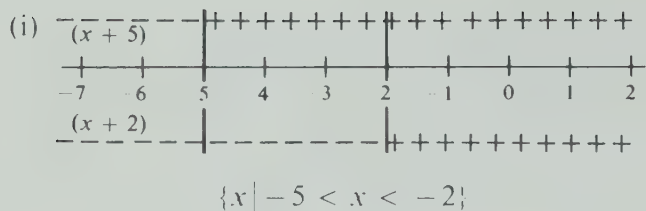
(p) $\{x | x > 5 \text{ or } x < -7\}$



Exercise 6.5, Page 99

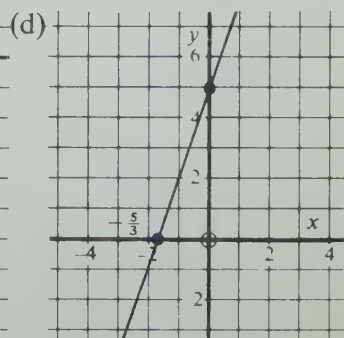
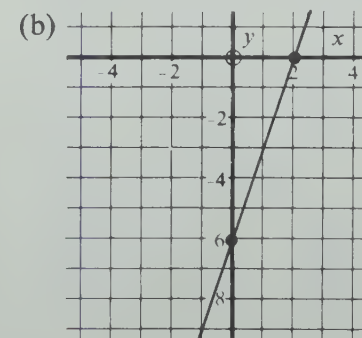
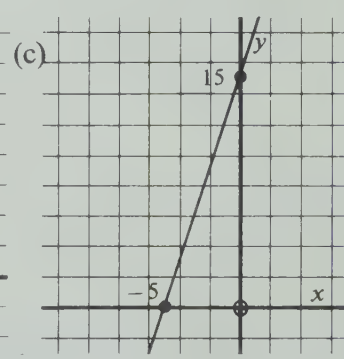
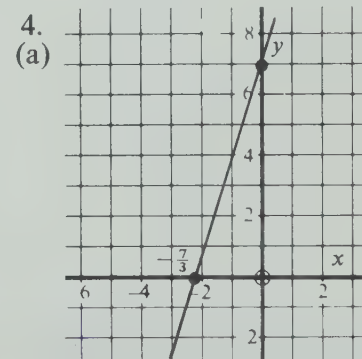
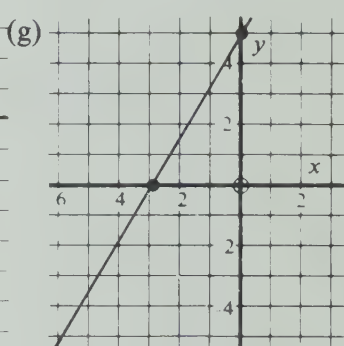
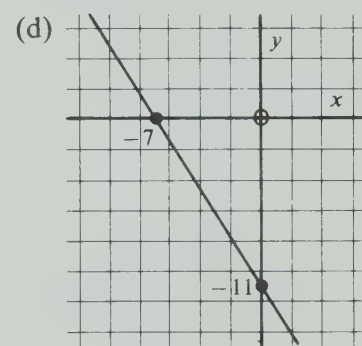
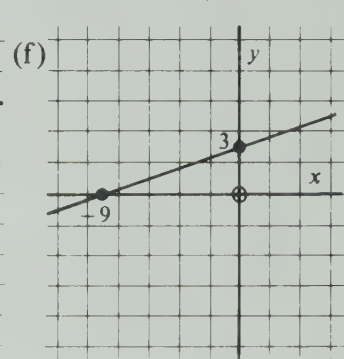
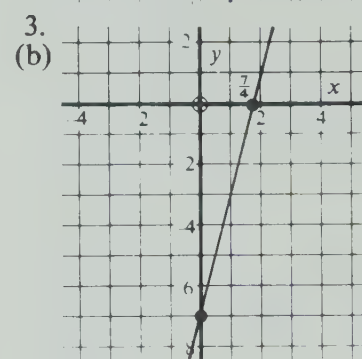
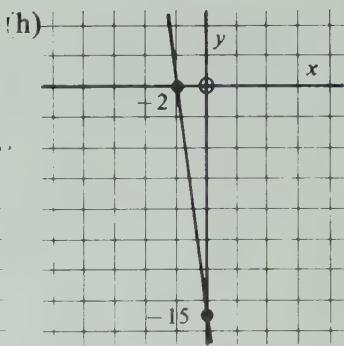
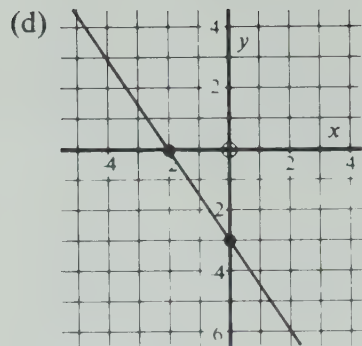
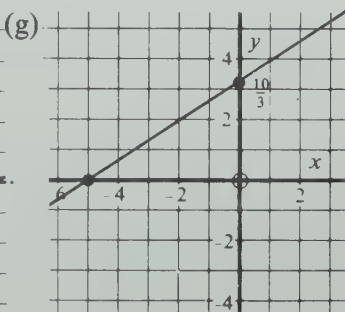
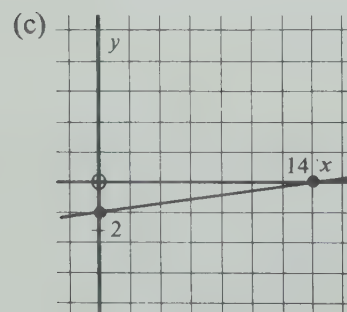
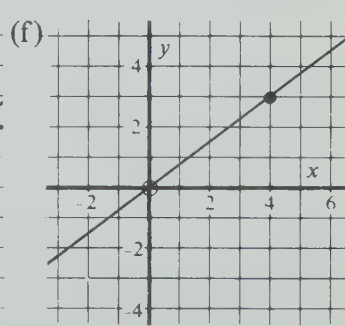
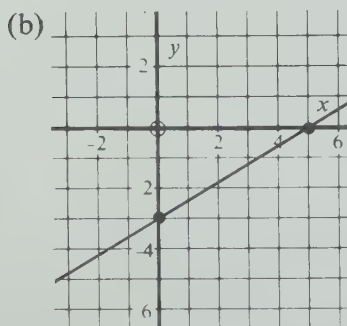
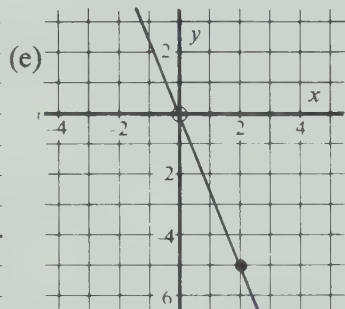
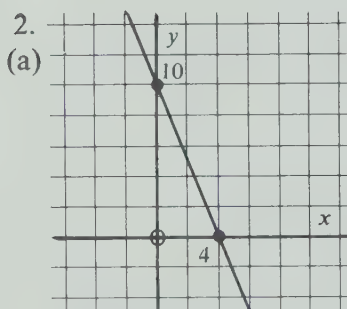
1. (a)

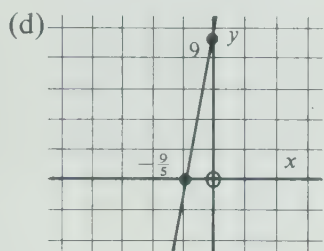
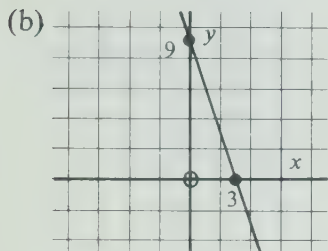
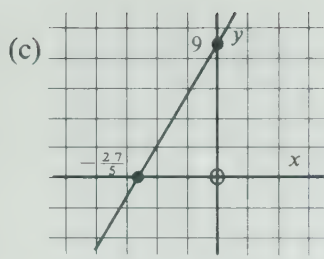
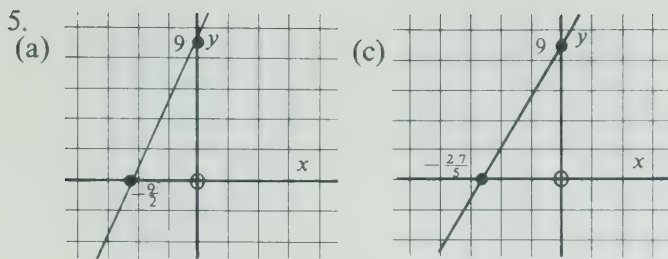




Exercise 7.1, Page 103

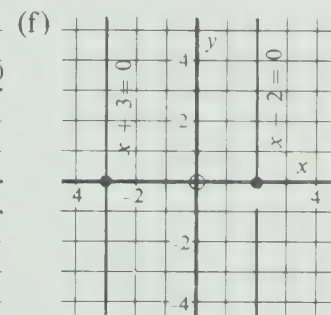
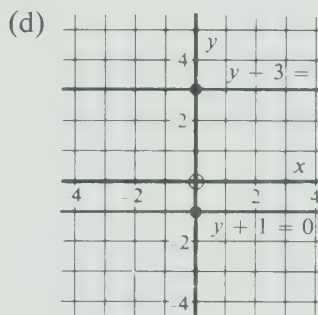
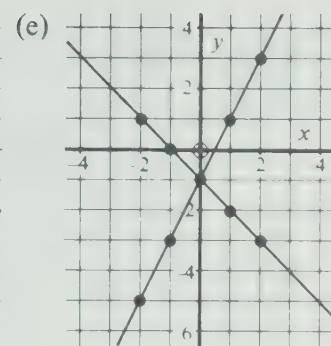
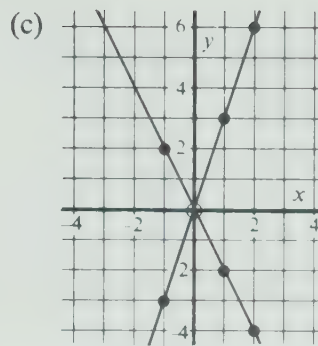
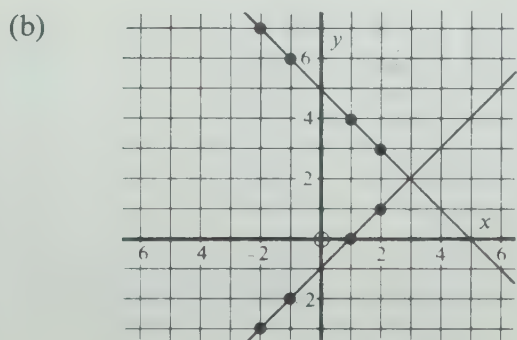
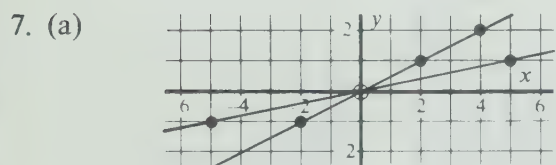
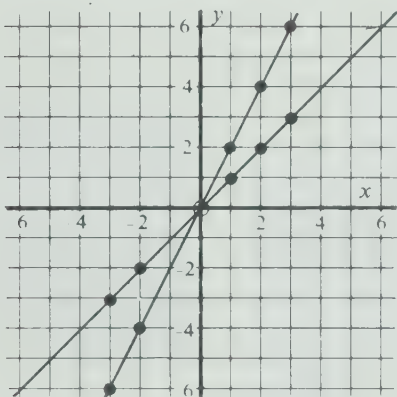
1. (a) 3, 3 (f) -5, 15
- (b) 3, 6 (g) 3, 2
- (c) 5, 3 (h) 8, 3
- (d) -4, 4 (i) -10, 15
- (e) -9, 6 (j) 8, -10



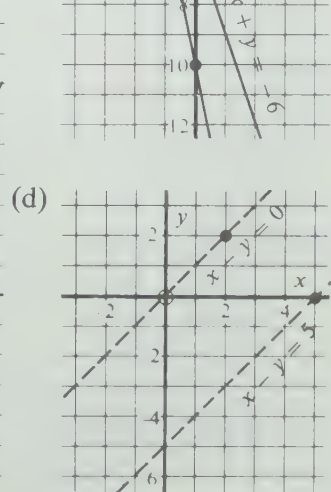
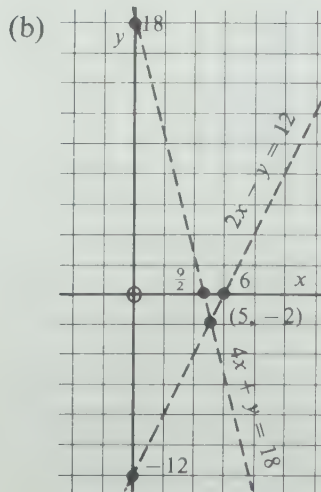
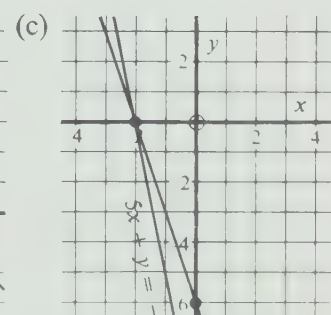
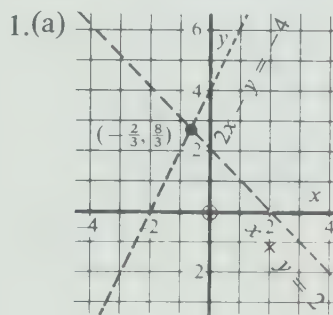


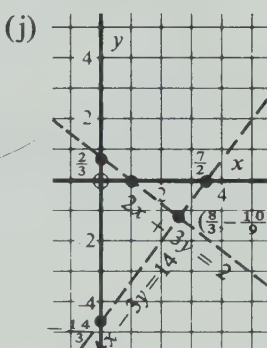
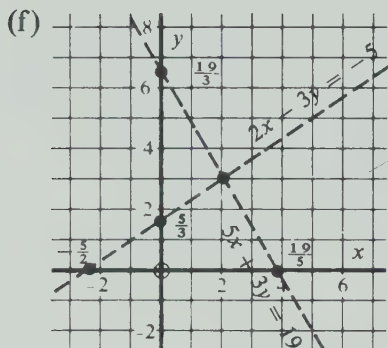
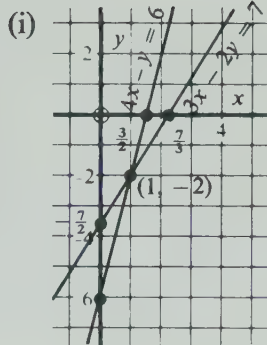
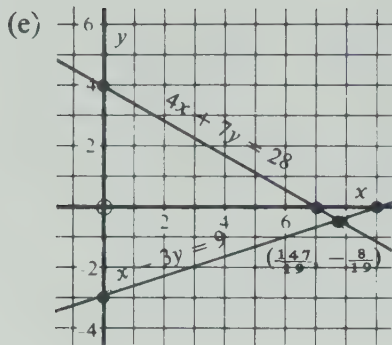
6. (a)

x	0	1	1	2	2	3	3	-2	-2	-3	-3
y	0	1	2	2	4	3	6	-2	-4	-3	-6



Exercise 7.2, Page 106

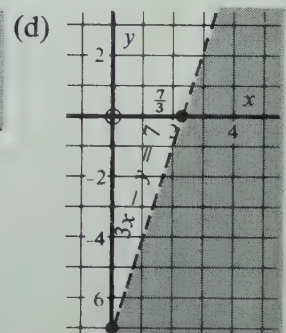
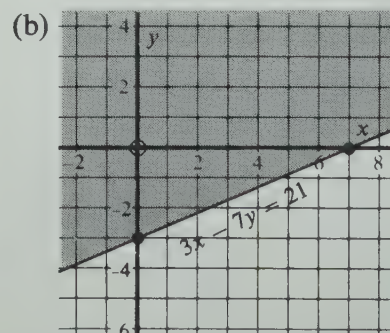
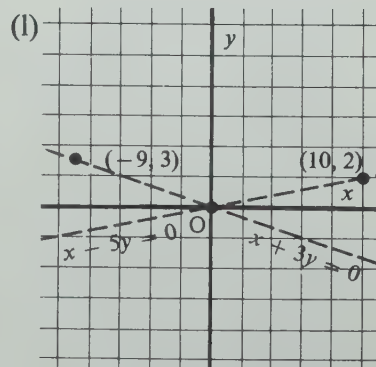
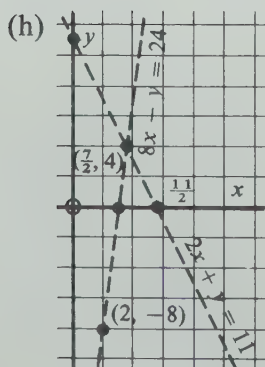
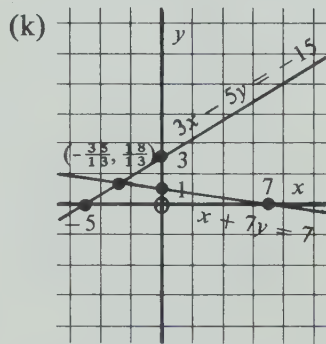
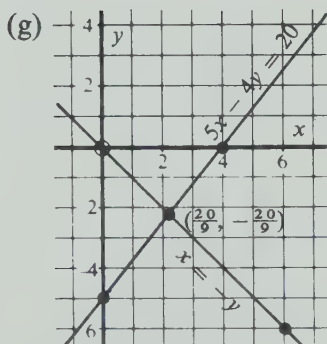
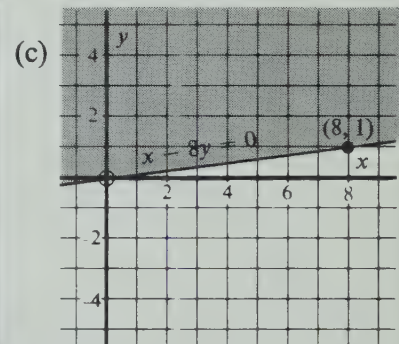
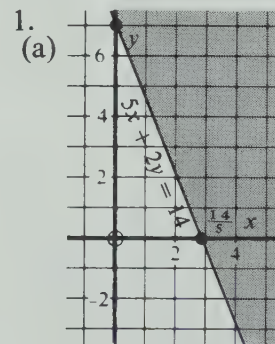


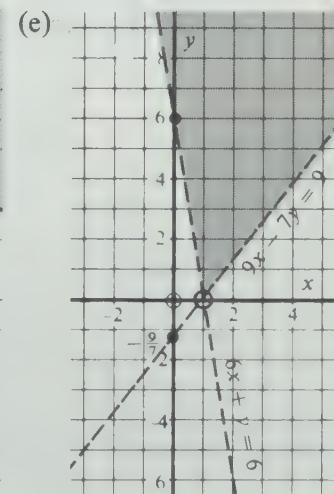
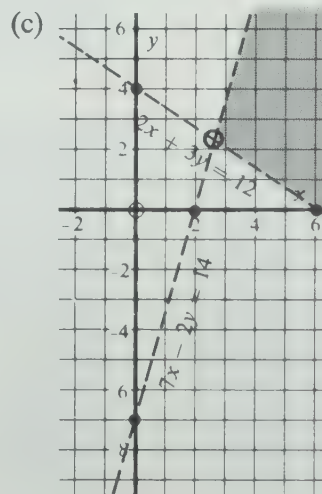
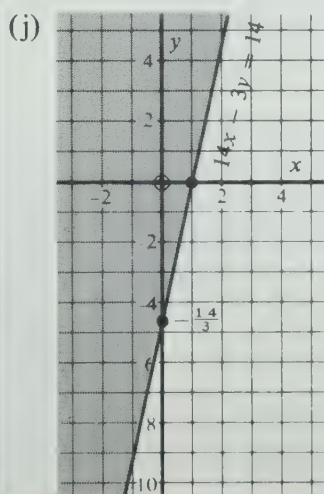
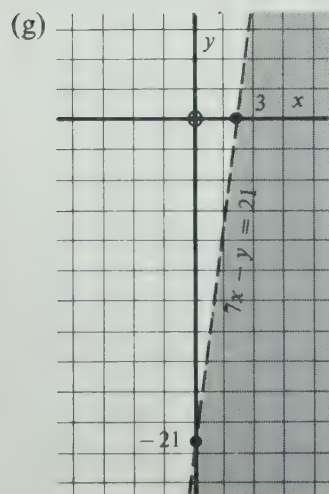
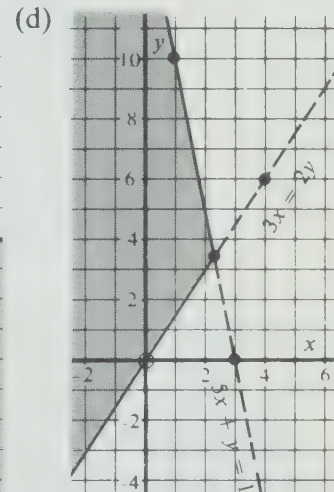
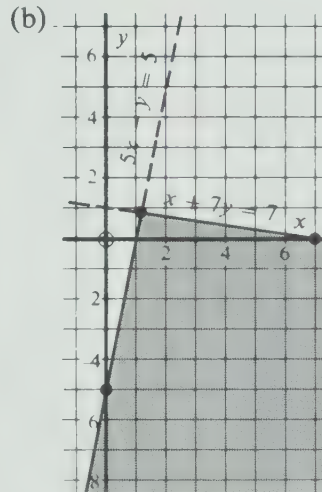
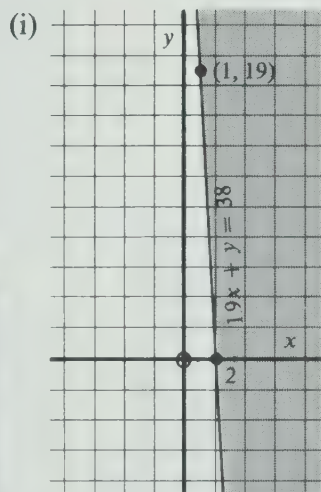
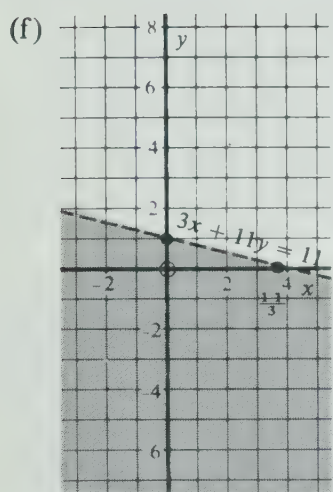
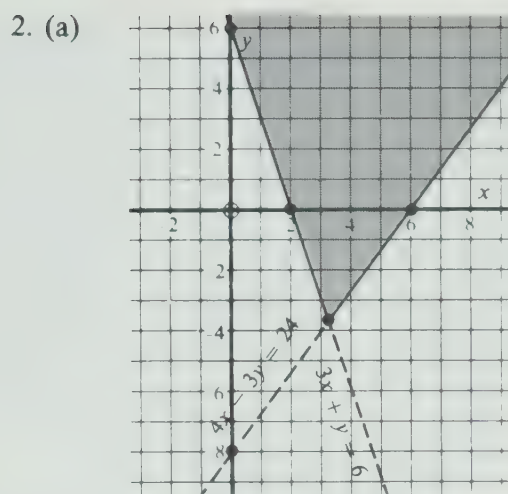
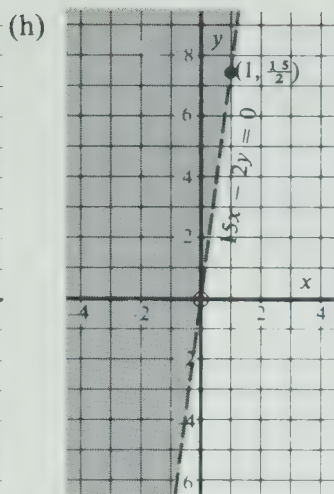
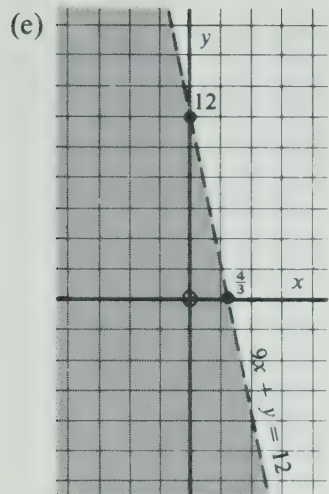


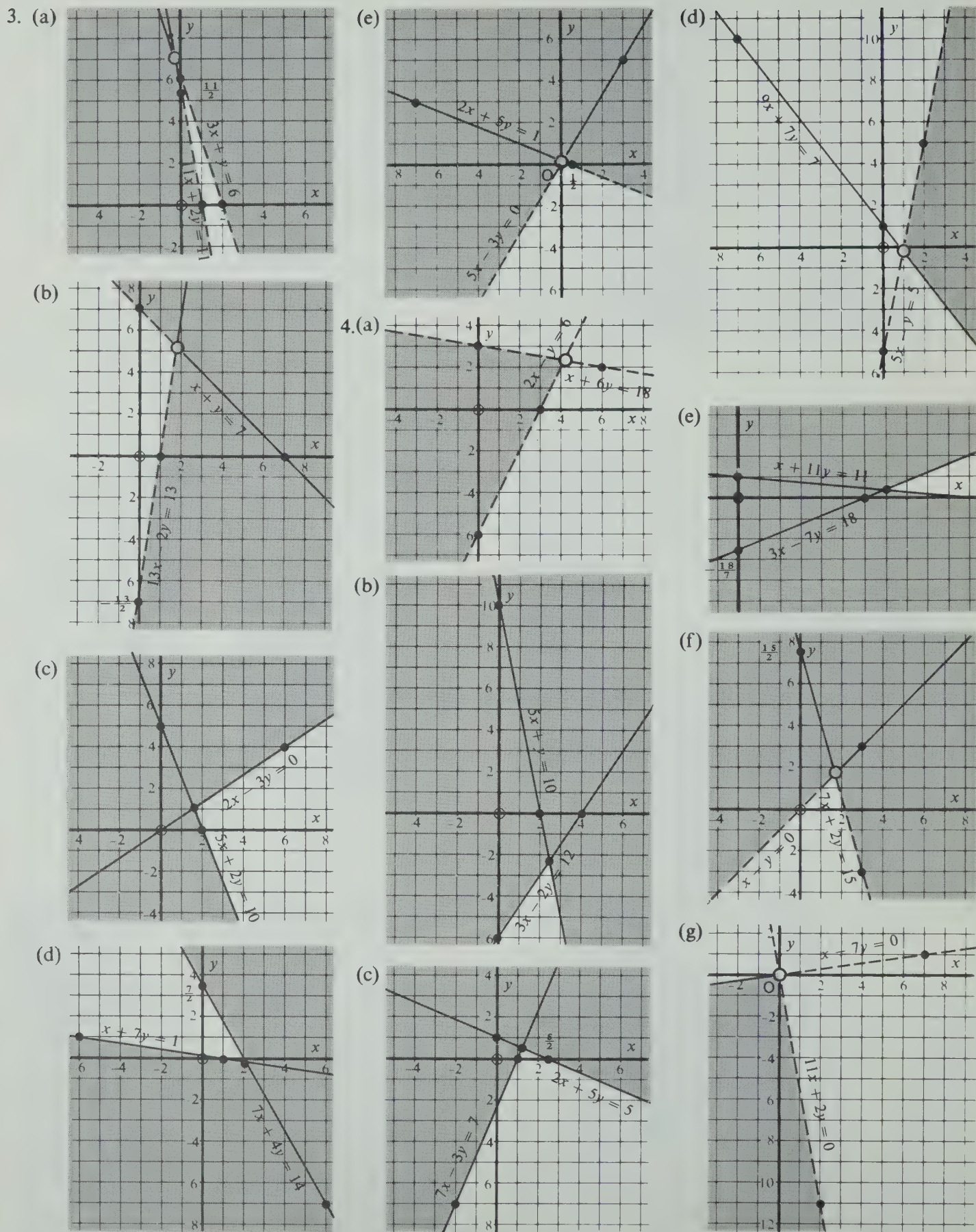
Exercise 7.3, Page 110

- (3, 2)
 - (5, -2)
 - (2, -1/3)
 - (3, -1)
 - (1/2, -3/4)
 - (2, 2)
 - (-5/5, -2)
 - (-1/2, 1/2)
- (-2, 2)
 - (1, -3)
 - (-2, 1)
 - (3, 1)
 - (10, 11)
 - (5, 6)
- (8, 5)
 - (5, 6)
 - (2, -3)
 - (7, -3/2)
 - (5, -1)
 - (6, -9)
- (3, 2)
 - (2, 3)
 - (3, -4)
 - (2, 1)
 - (3, -2)
 - (8, 2)
- (8, 12)
 - (18, 21)
 - (10, 6)
 - (14, 15)
 - (3, 2)
 - (20, 16)
 - (-9, -15)
 - (2, 5)

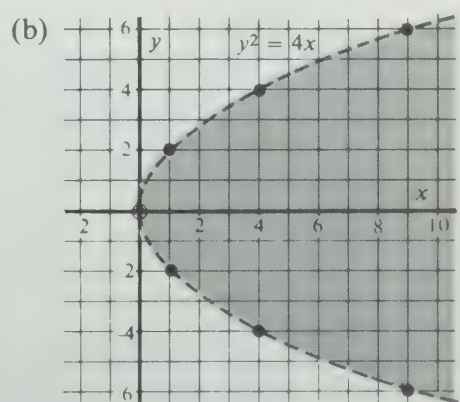
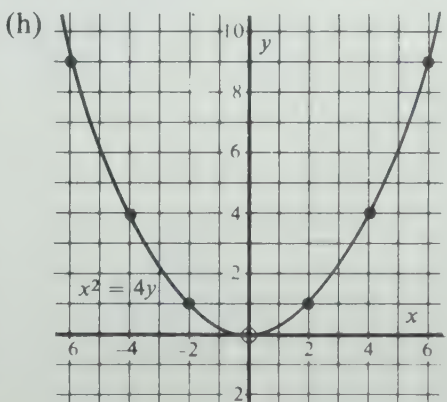
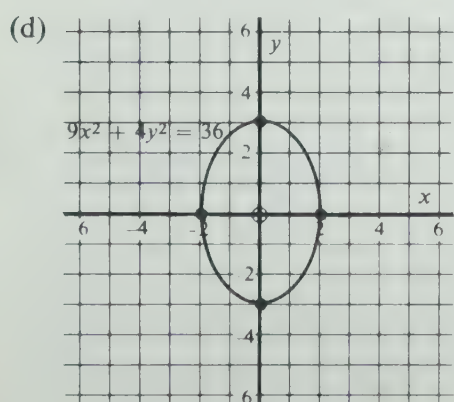
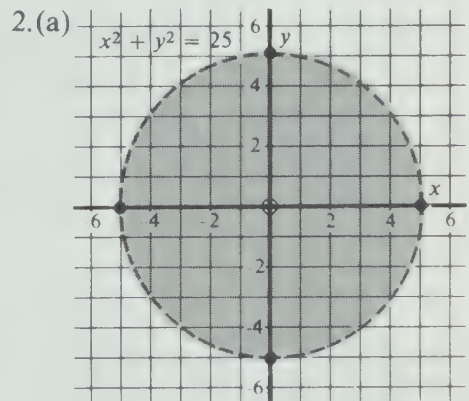
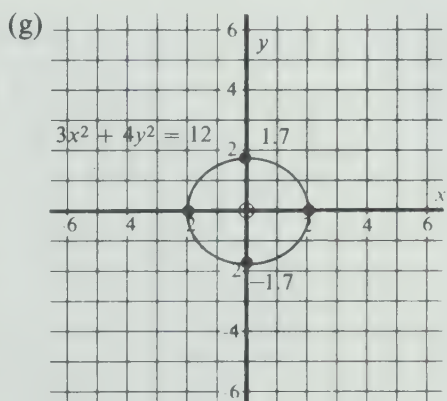
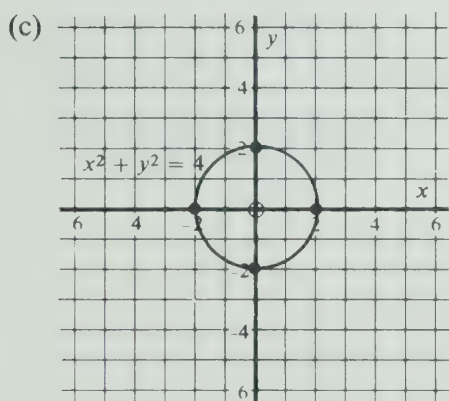
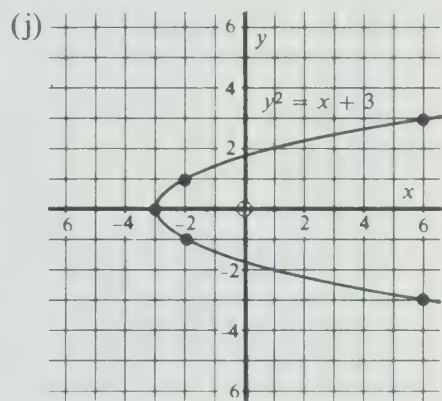
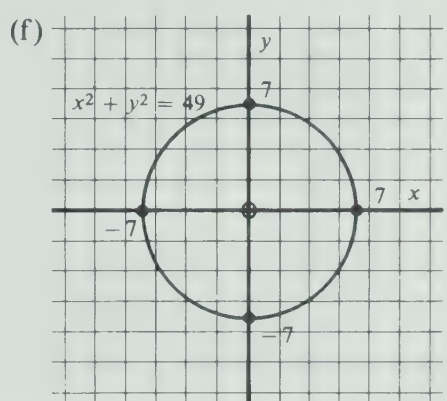
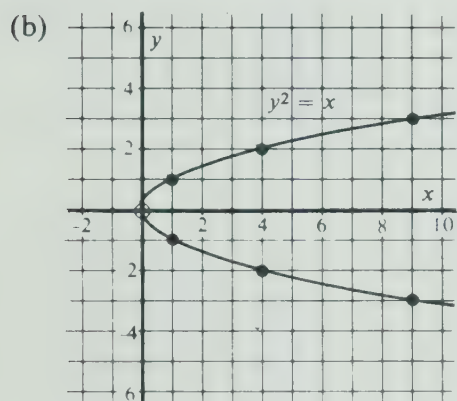
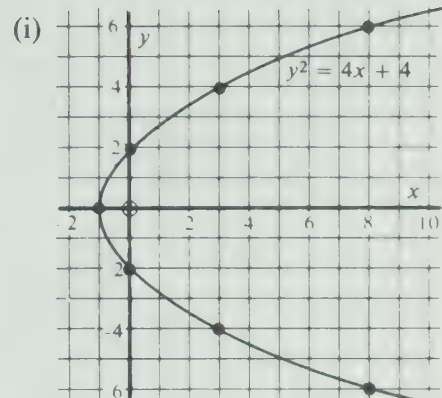
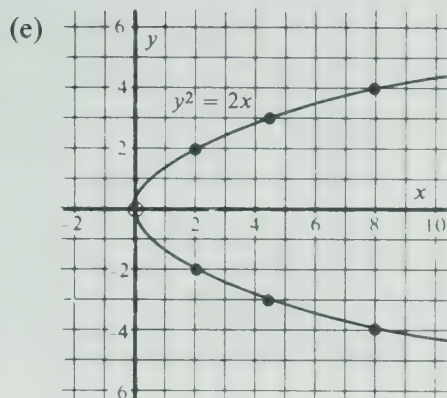
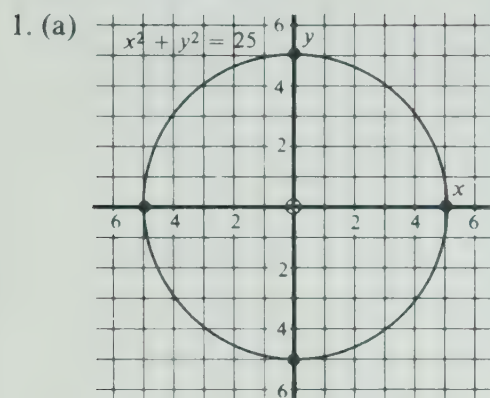
Exercise 7.4, Page 115

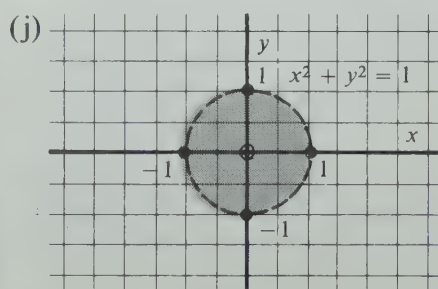
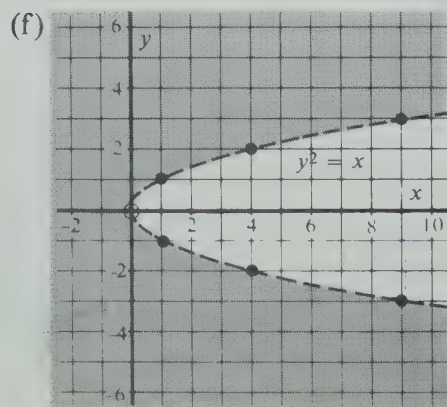
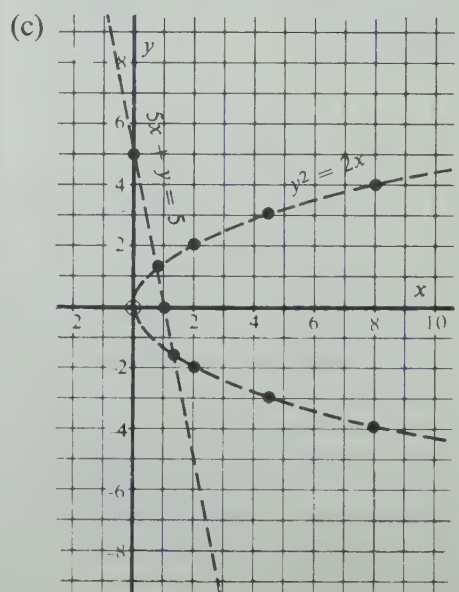
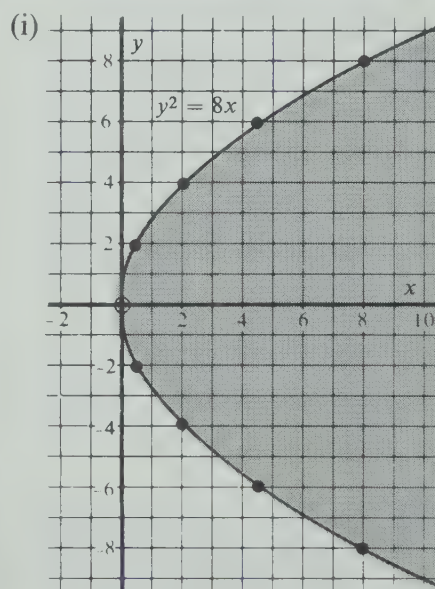
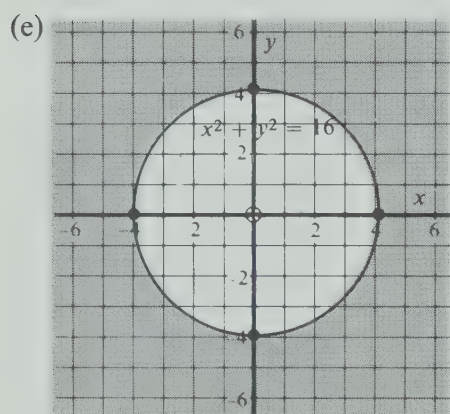
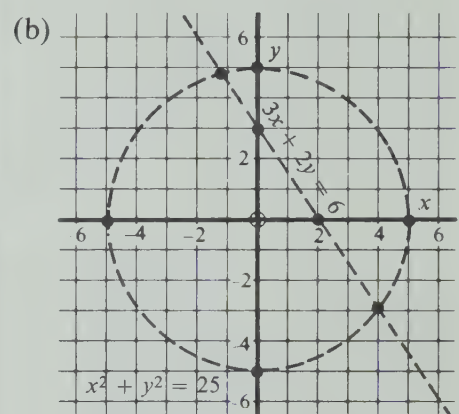
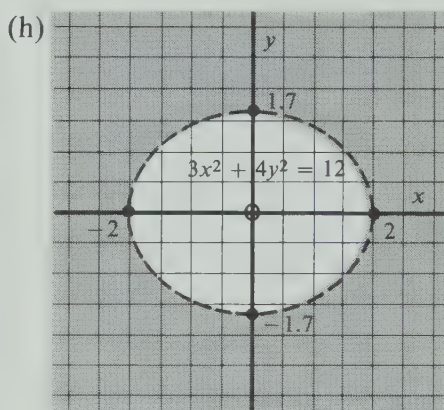
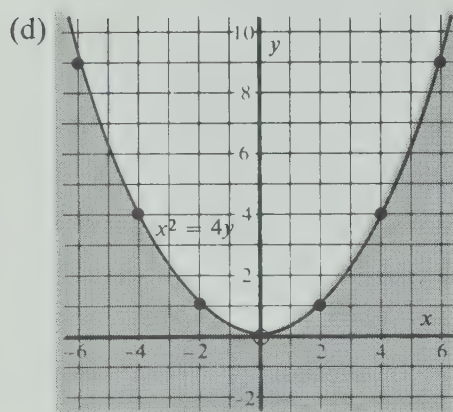
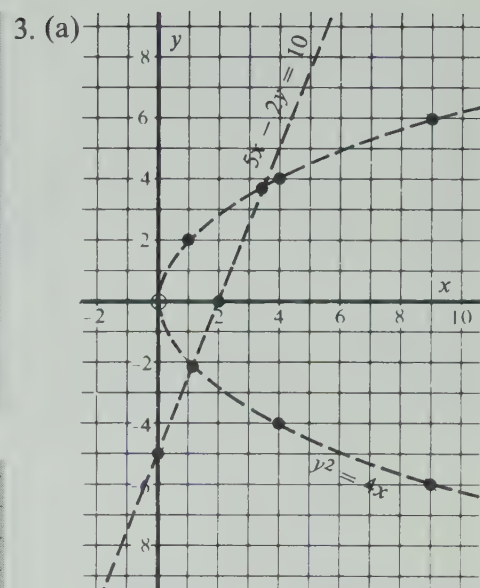
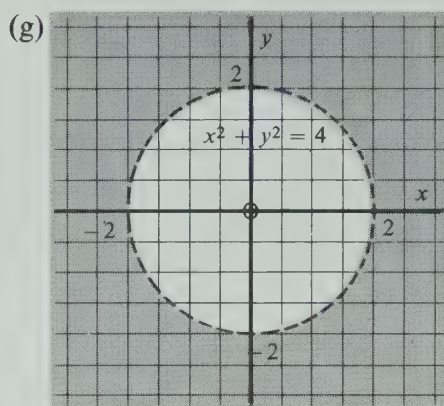
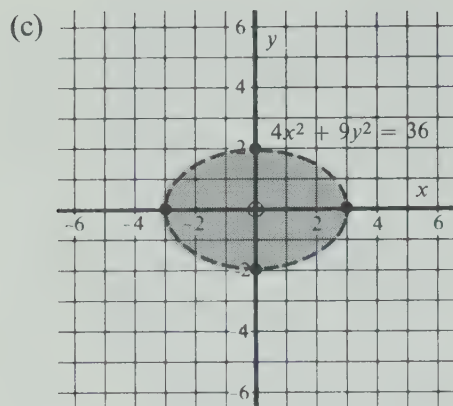


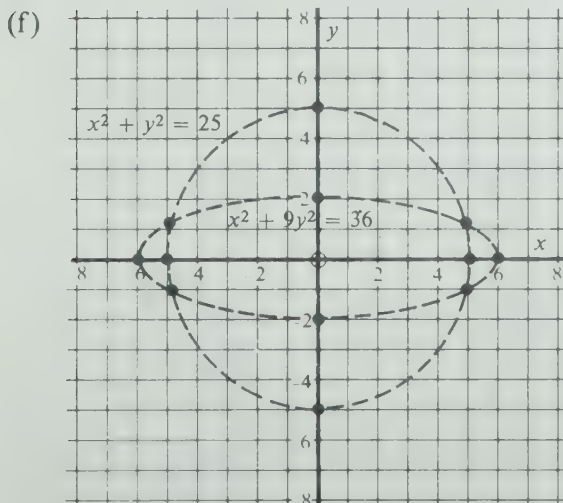
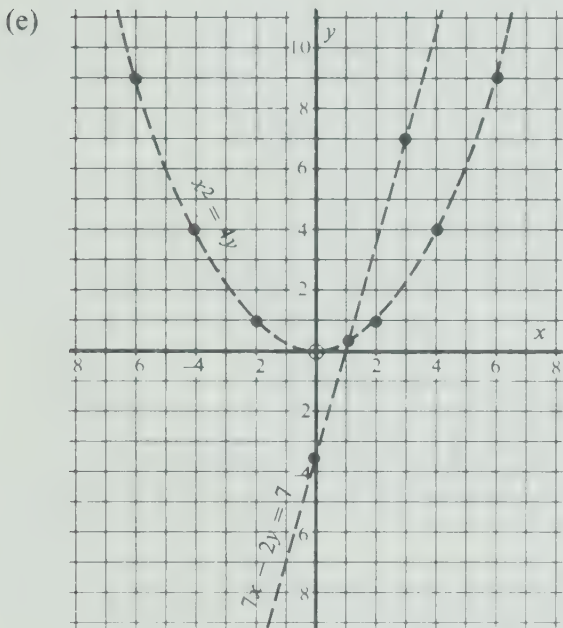
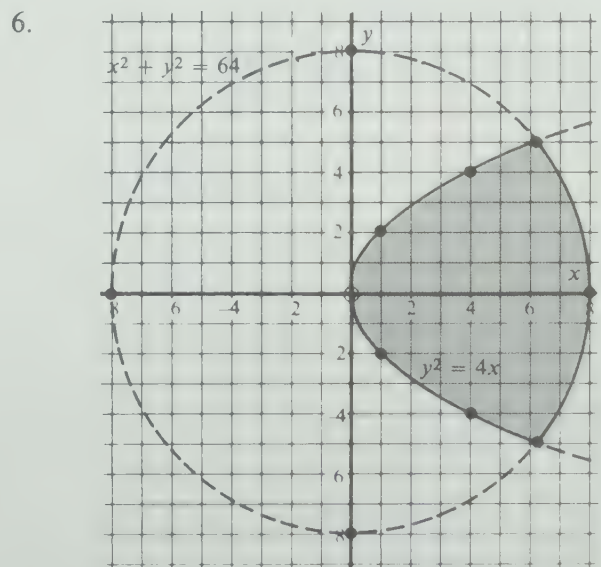
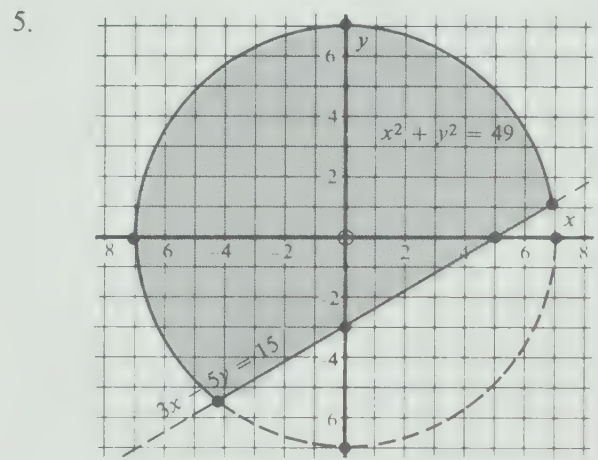
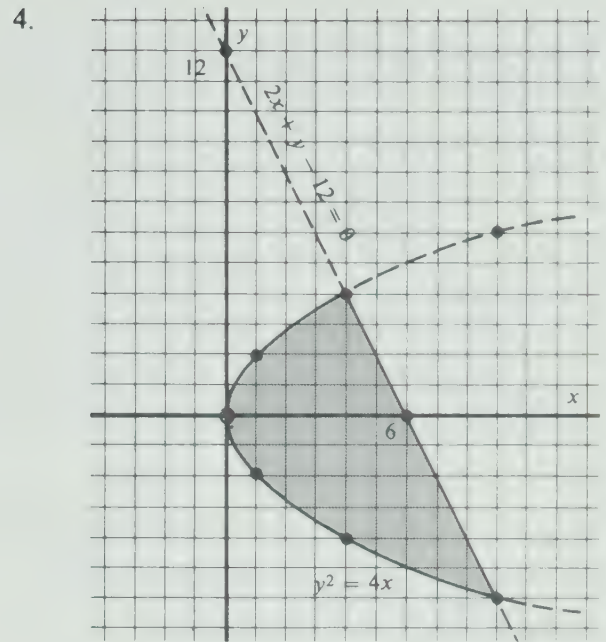
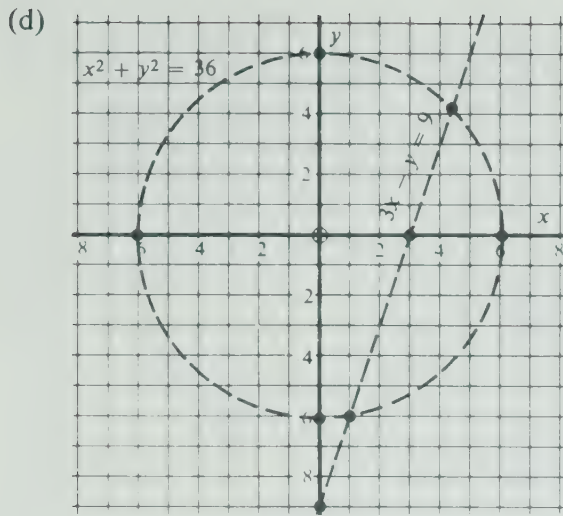




Exercise 7.5, Page 117







Exercise 8.2, Page 122

- 7, 11
- 18, 23
- 7, 3
- 35, 5
- Mass of a nail = 12 g
Mass of a screw = 14 g
- Number of 10 t trucks = 4
Number of 6 t trucks = 5
- $1\frac{7}{5}$
- Donna paid \$280
Pat paid \$170
- Where longer piece measures 9 m
and smaller measures 5 m
- Nails cost 20 ¢/kg
A hammer costs \$6.75
- Paul's charge per week = $\$ \frac{5}{8} n$.
Clem's charge per week = $\$ \frac{3}{8} n$.
- Anne sold 75.
Barb sold 45.
- Lighter has a mass of 135 kg
Heavier has a mass of 145 kg
- Number of \$10 bills is 8.
Number of \$2 bills is 6.
- Cost of hamburger = 55¢
Cost of French fries = 25¢
- 11 touchdowns, 6 field goals
- 14, 3 19. 31, 14
- 9 20. \$26.70
- Father's age now is 35 years.
Peter's age now is 7 years.
- Laurie's age now is 11 years.
Brother's age now is 7 years.
- Mother's present age is 36 years.
Daughter's present age is 11 years.
- Length = 13 m.
Width = 7 m.
- Length of equal sides = 9 m.
- Length = 20 m.
Width = 12 m.
- $1\frac{1}{5}$ l water and $\frac{4}{5}$ l of 50 %
antifreeze solution
- $7\frac{7}{9}$ l pure antifreeze
- 5 l of 30 % solution and
5 l of 70 % solution
- Doug is 9 years old.
Peter is 3 years old.
- $13\frac{1}{3}$ l of pure weed killer and
 $66\frac{2}{3}$ l 10 % weed killer.
- $7\frac{1}{17}$ l pure antifreeze and
 $52\frac{16}{17}$ l 15 % antifreeze.
Drain $7\frac{1}{17}$ l of 15 % antifreeze from
system and replace by $7\frac{1}{17}$ l of pure
antifreeze.
- 9 l of 20 % solution with 15 l
of 12 % solution.
- $\frac{4}{7}$ l of 15 % solution; 571.4 ml.
 $\frac{3}{7}$ l of 50 % solution; 428.6 ml.
- $14\frac{2}{7}$ l of 14 % solution.

Exercise 8.3, Page 126

- Mother's age now is 33 years.
Daughter's age now is 11 years.
- Doug is 14 years old.
Brother is 7 years old.
- Girl is 11 years old.
Brother is 14 years old.

MBS Exercise 2, Page 128

- | | |
|--------------------|-------------------|
| (a) 4 | (g) 8 |
| (b) 6 | (h) 12 |
| (c) 2 | (i) $\frac{9}{4}$ |
| (d) -3 | (j) -2 |
| (e) 32 | (k) 9 |
| (f) $\frac{21}{2}$ | (l) -25 |
- | | |
|-------------------|-----------------------|
| (a) $\frac{q}{p}$ | (f) $\frac{de}{3d-1}$ |
|-------------------|-----------------------|

$$(b) \frac{-5}{t-w}$$

$$(c) rs$$

$$(d) \frac{c-b}{a}$$

$$(e) \frac{b+4}{a+b}$$

$$(g) \frac{18}{5}, x \neq 0$$

$$(h) \frac{bc}{3a}$$

$$(i) -\frac{1}{3}, x \neq 0$$

$$(j) 3, x \neq -2$$

$$3. (a) x \geq 1$$

$$(b) x > -2$$

$$(c) x > -3$$

$$(d) x < -\frac{1}{3}$$

$$(e) x \geq -2$$

$$(f) x < -3$$

$$(g) x > 10$$

$$(h) x \geq 5$$

$$(i) x \geq -\frac{23}{4}$$

$$(j) x > -1$$

$$4. (a) x > 3$$

$$(b) x \leq 1$$

$$(c) x > -4$$

$$(d) x \leq -3$$

$$(e) x > -5$$

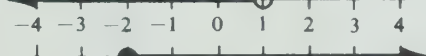
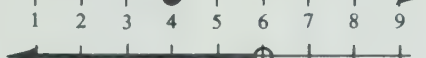
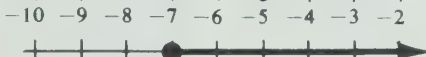
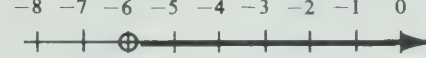
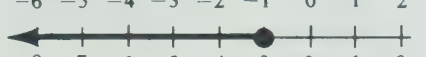
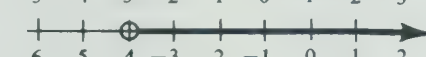
$$(f) x \leq -5$$

$$(g) x \geq 4$$

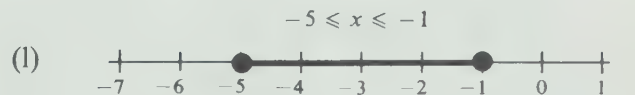
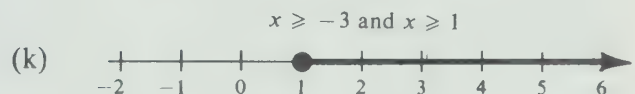
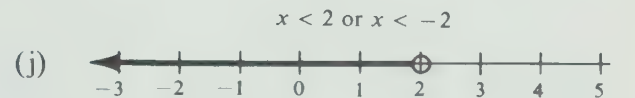
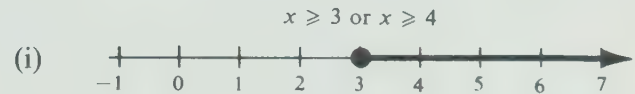
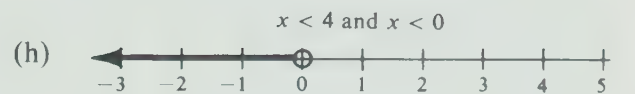
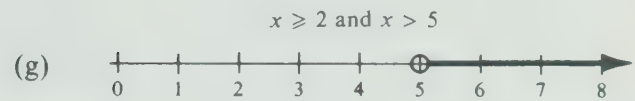
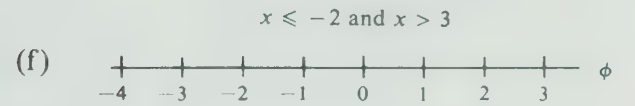
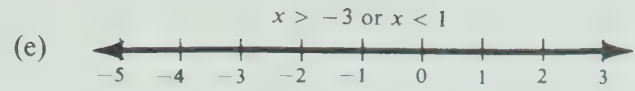
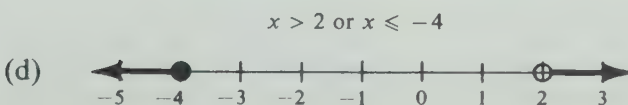
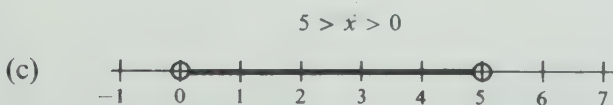
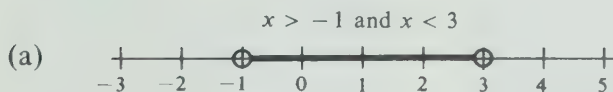
$$(h) x < 1$$

$$(i) x \geq -4$$

$$(j) x < 2$$



5.

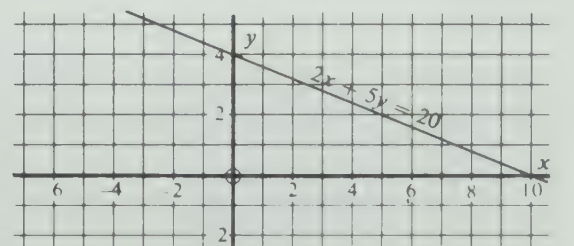


$$6. (a) \{6, 8\}$$

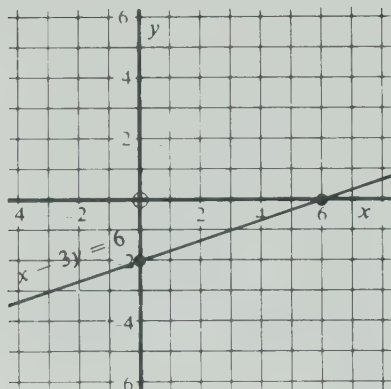
$$(b) \{2, 4, 5, 6, 7, 8, 10\}$$

$$7. (a) x\text{-intercept} = 10$$

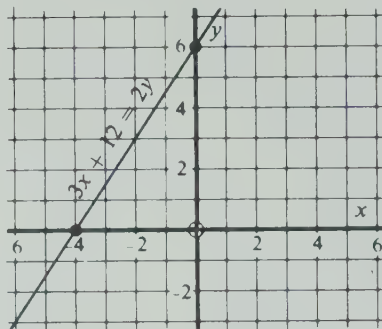
$$y\text{-intercept} = 4$$



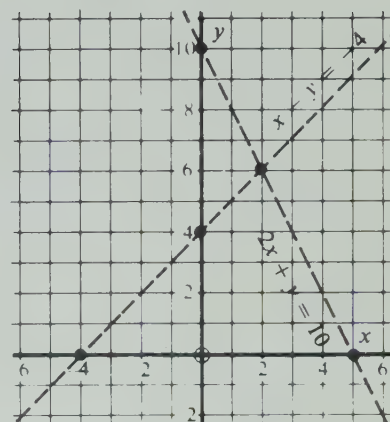
- (b) x -intercept = 6
 y -intercept = -2



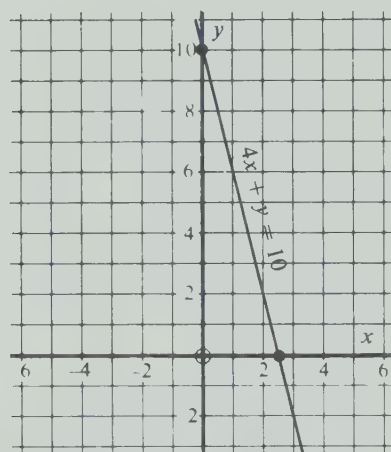
- (e) x -intercept = -4
 y -intercept = 6



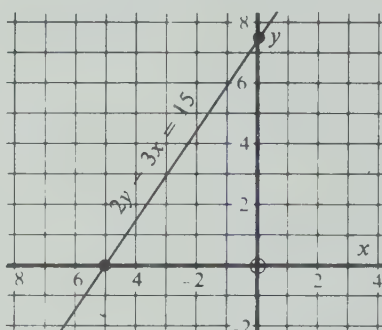
- (c) S.S. = $\{(2, 6)\}$



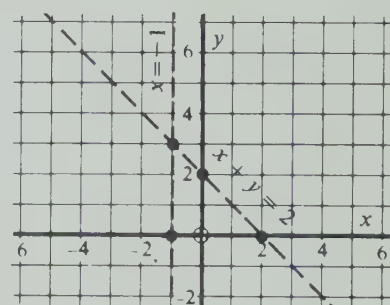
- (c) x -intercept = $2\frac{1}{2}$
 y -intercept = 10



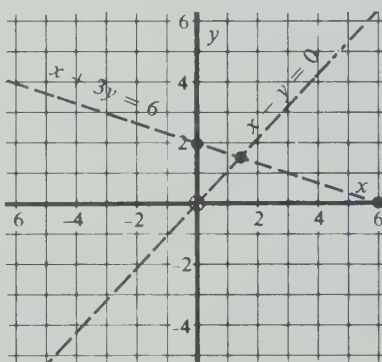
- (f) x -intercept = -5
 y -intercept = $7\frac{1}{2}$



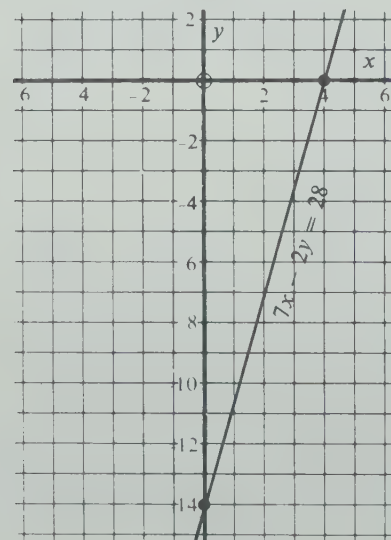
- (d) S.S. = $\{(-1, 3)\}$



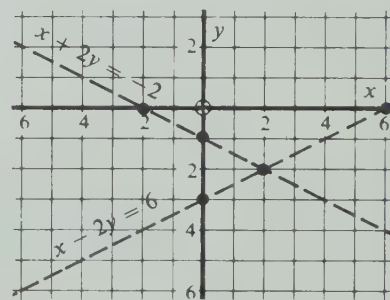
8. (a) S.S. = $\{(\frac{3}{2}, \frac{3}{2})\}$



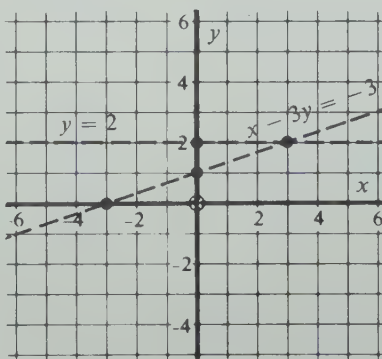
- (d) x -intercept = 4
 y -intercept = -14



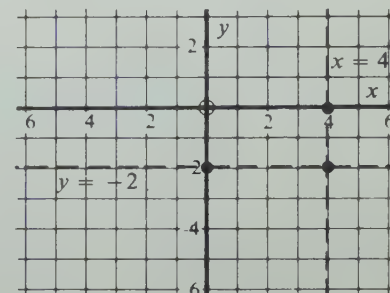
- (e) S.S. = $\{(2, -2)\}$



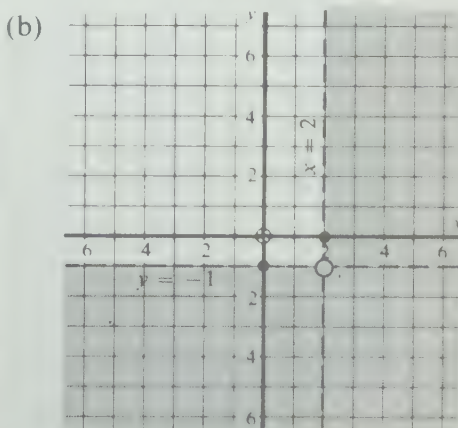
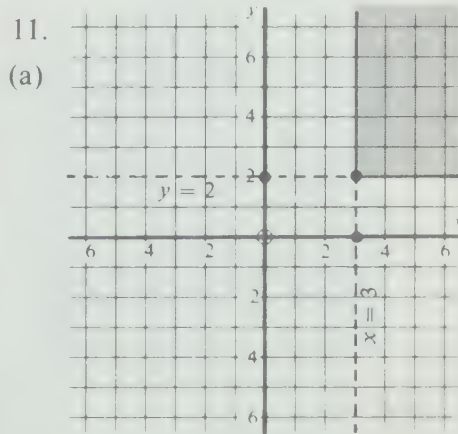
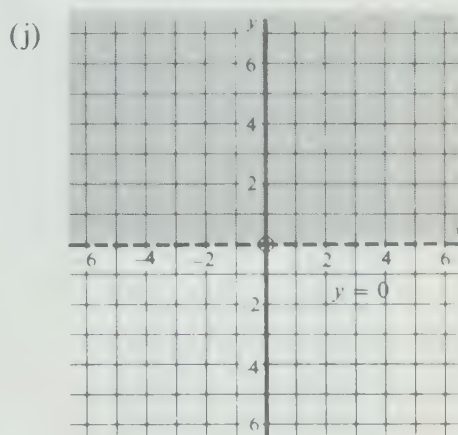
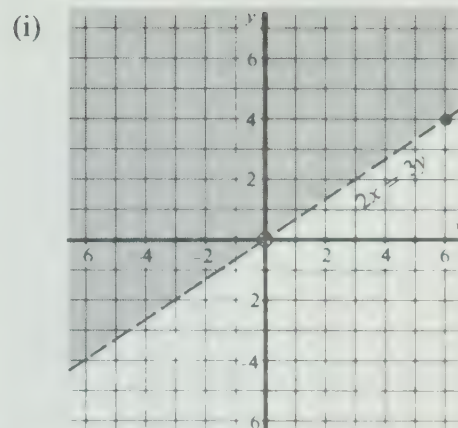
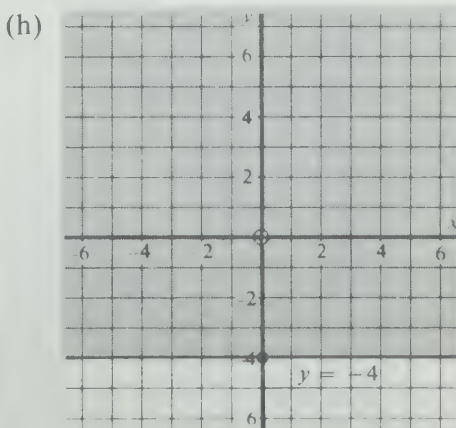
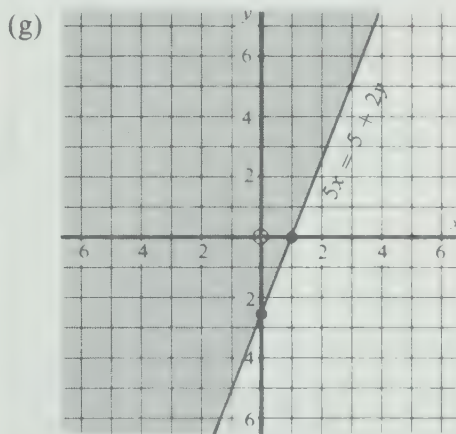
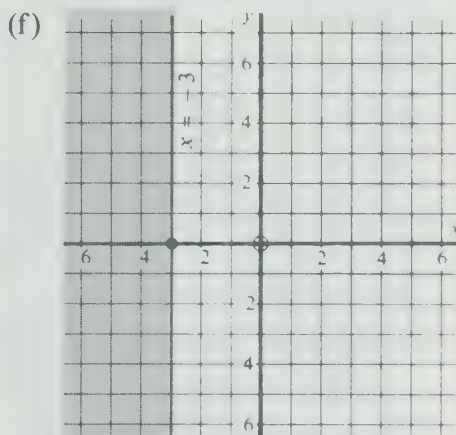
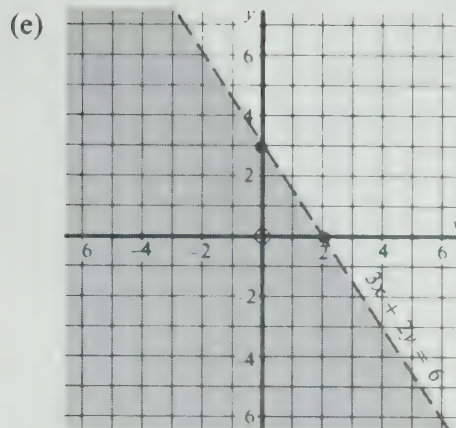
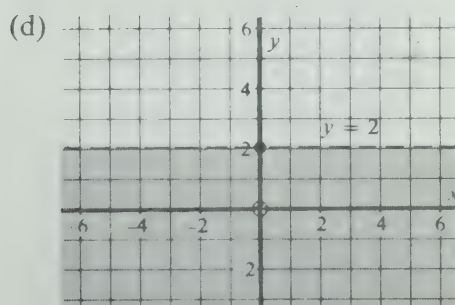
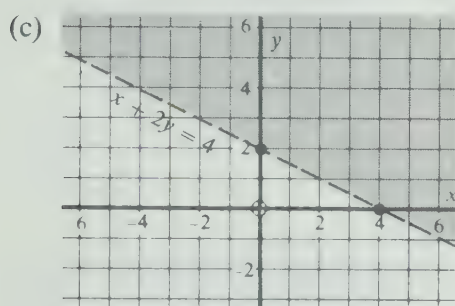
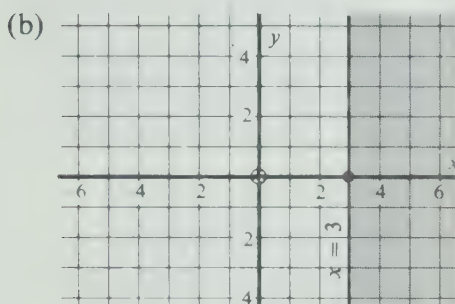
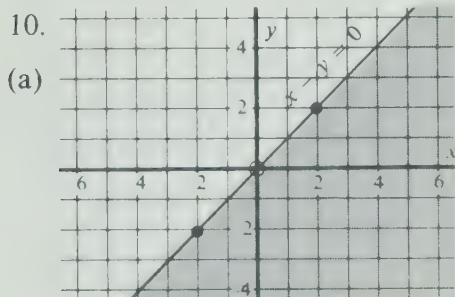
- (b) S.S. = $\{(3, 2)\}$

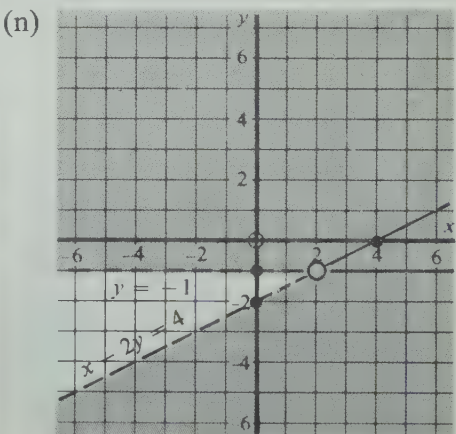
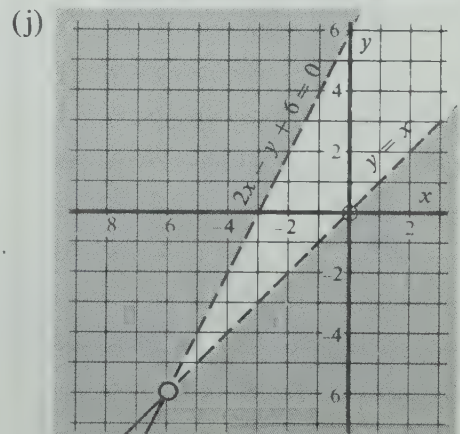
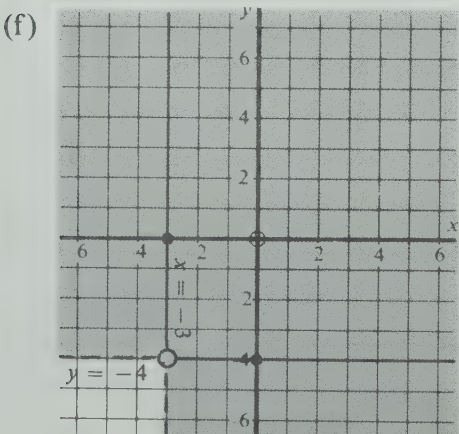
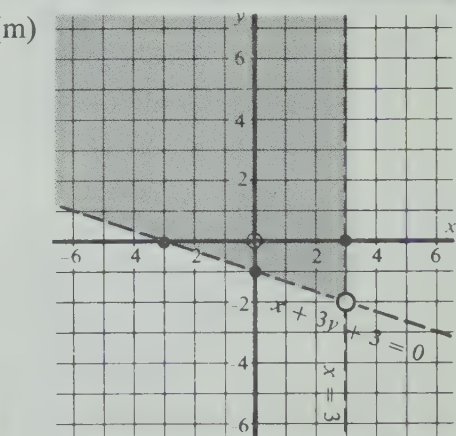
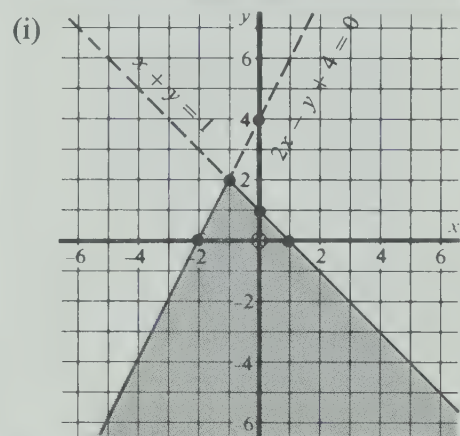
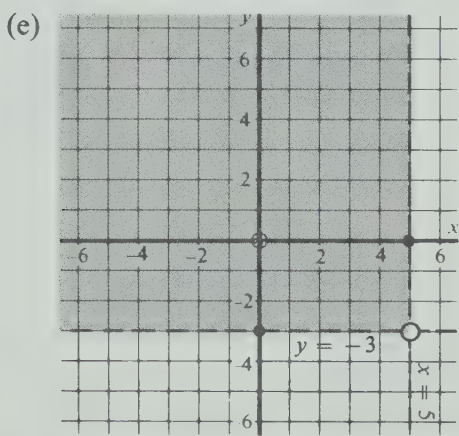
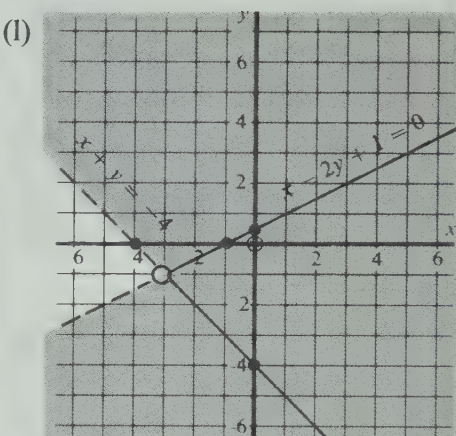
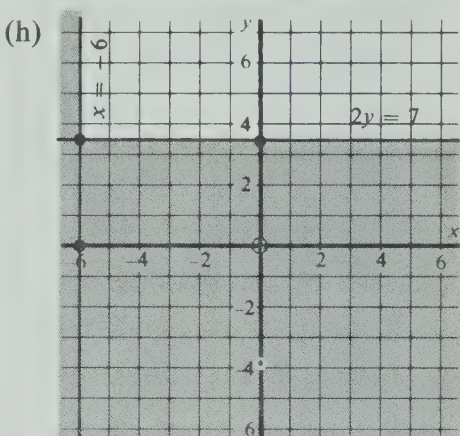
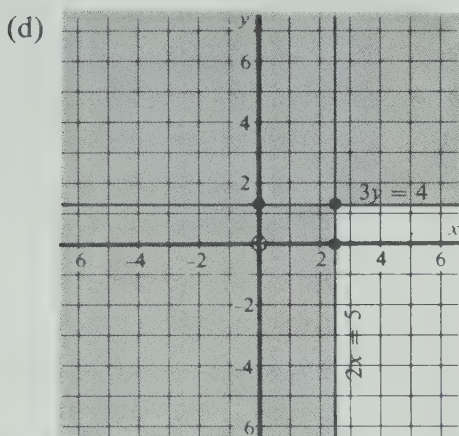
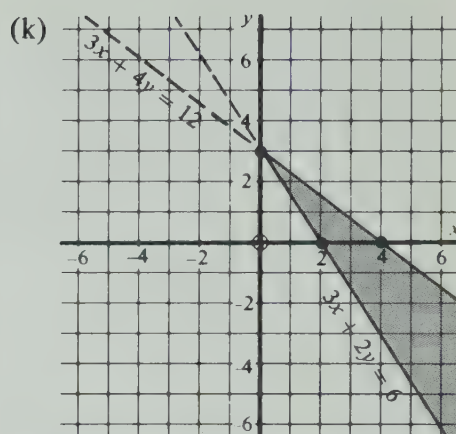
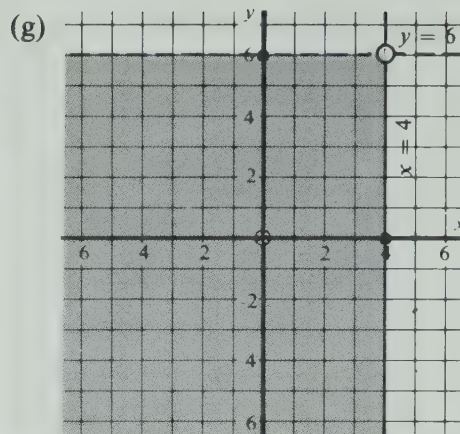
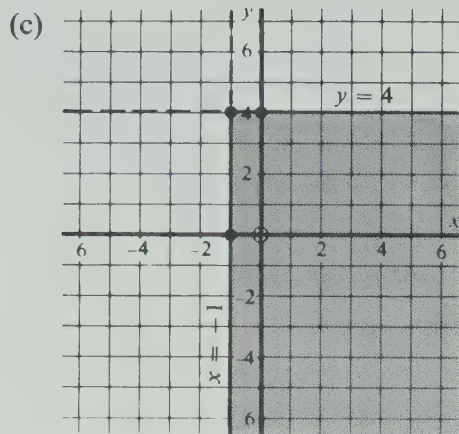


- (f) S.S. = $\{(4, -2)\}$



9. (a) $x = 2, y = -1$
 (b) $x = -3, y = 2$
 (c) $x = 5, y = 1$
 (d) $x = 3, y = -2$
 (e) $x = 4, y = 3$
 (f) $x = 5, y = \frac{1}{2}$
 (g) $x = 10, y = 8$
 (h) $x = 6, y = 24$
 (i) $x = -4, y = -12$
 (j) $x = -3, y = 5$





12. 173, -130
13. 46, 16
14. 35, 8
15. Number of girls = 22.
Number of boys = 11.
16. 1 bag of potato chips cost 15¢.
1 doughnut cost 9¢.
17. 25
18. Profit on 1 box of cards was 40¢.
Profit on 1 chocolate bar was 15¢.
19. (a) a^6b^{10} (c) $5^9 \times 6^{12}$
(b) $6x^3y^6$ (d) 4^9
20. (a) $7^2 \times 6^7$ (c) $2a^3$
(b) $5^{\frac{7}{4}}$ (d) $3a^{-3}b^4c^7$
21. (a) -2 (d) 1
(b) 1 (e) $\frac{1}{4x^2}$
(c) -1 (f) -1
22. (a) $10t^3 + t^2$
(b) $4r^3 - 7r^2 - 6r$
(c) 0
23. (a) $2ab(2a + 1)$
(b) $n(r - 1)(r - 2)$
(c) $(k + 3)(x + y)$
(d) $(2w + 2t - 1)(w - t)$
(e) $(3p - 4)^2$
(f) $3(2x + 3)^2$
(g) $2(5x + 6y)(5x - 6y)$
(h) $(2x - y)(4x^2 + 2xy + y^2)$
(i) $(3a + 2b)(9a^2 + 6ab + 4b^2)$
(j) $(k^2 + 8h)(k - 6)$
(k) $(a^2 - 2)(a - 12)$
(l) $(x - 4)(x^2 - 3)$
24. (a) $\frac{11x + 28}{(x + 3)(x + 2)}$ (c) $\frac{7k - 6h}{k^2 - h^2}$
(b) $\frac{-y + 12}{(y - 5)(y + 2)}$ (d) $\frac{-2y}{x^2 - y^2}$
25. (a) $\pm \frac{3}{2}$ (d) -5 or 1
(b) -5 (e) -5 or 4
(c) 0 or $-\frac{1}{2}$ (f) $-\frac{5}{3}$ or -3
26. (a) $20 + 6\sqrt{11}$
(b) $\sqrt{14} - 3\sqrt{7} - 4\sqrt{2} + 12$
(c) $7 - 4\sqrt{5}$
(d) $83 - 12\sqrt{35}$
(e) $\sqrt{42} + 3\sqrt{30} + 4\sqrt{14} + 12\sqrt{10}$
(f) $a + b + 2\sqrt{ab}$

Review Exercise, Page 136

8. (a) 3^{-4} (d) $3r$
(b) x (e) $(-5)^2$
(c) m^6 (f) $2s$
9. (a) 11 (d) 3
(b) 2 (e) 2
(c) 5 (f) 13
10. (a) $-16a + 6b$
(b) $-a^2 + 15ab - 11b^2$
(c) $2a^3 + a^2b - 14ab^2 + 8b^3$
(d) $a - 5a^{\frac{1}{2}}b^{\frac{1}{2}} + 6b$
11. (a) 8 (d) $64a^6b^{12}$
(b) $\frac{b^4}{81a^6}$ (e) 128
(c) a^6b^{-24} (f) 1.0×10^{-10}
12. (a) $-2x$ (e) $13cd$
(b) $4ab$ (f) $3ef + 2cd$
(c) $7z$ (g) $5x^2y$
(d) $2x^2 - 2x - 3$ (h) $-x^2y + 3xy$
13. (a) $2c^2 + c$ (h) $6c^2 + 7cd - 3d^2$
(b) $12x^2 - 6x$ (i) $25x^2 - 70x + 49$
(c) $40xy - 35y$ (j) $4y^2 - 9$
(d) $25xy - 50$ (k) $7a^2 + 19ab - 6b^2$
(e) $p^2 - 5pq + 6q^2$ (l) $4p^2 - 12pq + 9q^2$
(f) $2c^2 + cd - 15d^2$ (m) $25x^2 + 60x + 36$
(g) $4x^2 + 4xy - 3y^2$ (n) $49c^2 - 4d^2$
14. (a) q (d) $1 - \frac{n}{m}$
(b) $a - b$ (e) $x + 4$
(c) $f - e$ (f) $x - 3$
15. (a) 3 (d) 3
(b) 3 (e) 3
(c) 2 (f) 4
16. (a) + (d) -
(b) - (e) -
(c) + (f) +

17. $x + 5$

18. $x + 3$

19. $x + 2$

20. (a) $27x^3 - 27x^2 + 9x - 1$
 (b) $125a^3 - 150a^2 + 60a - 8$
 (c) $4x^2 - 20x + 25$
 (d) $a^2 + 6ab + 9b^2$
 (e) $m^3 - 9m^2 + 27m - 27$
 (f) $4m^2 - 25n^2$
 (g) $9p^2 + 6pq + q^2$
 (h) $r^2 - 4s^2$

21. (a) $5(a + 3)$ (d) $t(3t - 2)$
 (b) $9a(a + 2)$ (e) $3x(y + 2x)$
 (c) $3(x^2 + 2)$ (f) $2c(2c + 3)$

22. (a) $(x + 6)(x - 6)$ (d) $(2x + 3)(2x - 3)$
 (b) $(y + 4)(y - 4)$ (e) $(a + 7)(a - 7)$
 (c) $(10 + t)(10 - t)$ (f) $(9 + t^2)(3 + t)(3 - t)$

23. (a) $(a + 2)^2$ (d) $(5c - 1)^2$
 (b) $(x + 3)^2$ (e) $(m + 1)^2$
 (c) $(2r + 3)^2$ (f) $(3t - 7)^2$

24. (a) $(x + 3)(x + 2)$ (d) $(a - 3)(a - 1)$
 (b) $(a - 5)(a + 3)$ (e) $(x - 6)(x - 3)$
 (c) $(c + 6)(c + 2)$ (f) $(x + 7)(x - 4)$

25. (a) $(3a - 2)(2a - 1)$ (d) $(2x + 3)(x + 3)$
 (b) $(5x - 2)(x + 3)$ (e) $(3b - 2)(2b + 1)$
 (c) $(5c + 7)(2c - 3)$ (f) $(5s - 1)(2s + 7)$

26. (a) $(x + 5)(p - q)$ (d) $(x - 5)(x^2 + 3)$
 (b) $(x + y)(x + a)$ (e) $(a + b)(7 + x)$
 (c) $(a - c)(a - b)$ (f) $(x - 2)(3x^2 - 5)$

27. (a) $(5y - 2z)(25y^2 + 10yz + 4z^2)$
 (b) $(a - 7)(a^2 + 7a + 49)$
 (c) $(2r + 1)(4r^2 - 2r + 1)$
 (d) $(3x - y)(9x^2 + 3xy + y^2)$
 (e) $(m + 2n)(m^2 + 2mn + 4n^2)$
 (f) $(2p - 5)(4p^2 + 10p + 25)$

28. (a) $(2a + 1)(a + 4)$ (f) $4(y + 3)^2$
 (b) $(2r + 5)(r + 1)$ (g) $(3c + 2)(c - 2)$
 (c) $(2x - 7)(x + 2)$ (h) $(8d + 5)(3d + 1)$
 (d) $(7y + 11)(y - 1)$ (i) $(b + 9)^2$
 (e) $2(2a - 1)(3a - 7)$ (j) $(2y - 6)(y - 4)$

29. (a) $98 - 24\sqrt{10}$
 (b) $24\sqrt{6} + 42\sqrt{2} - 20\sqrt{3} - 35$
 (c) $39\sqrt{2}$
 (d) $15ab\sqrt{b}$

30. (a) $\frac{\sqrt{30}}{9}$

(b) $\frac{2\sqrt{11} + 3}{35}$

(c) $\frac{2\sqrt{15} - \sqrt{21}}{13}$

(d) $\frac{a(\sqrt{a} + \sqrt{b})}{a - b}$

31. (a) $\frac{8b + 15a}{20a^2b^2}$

(b) $\frac{2a - 5b}{a - 2b}$

(c) $\frac{a}{a + 2b}$

(d) $\frac{-19b}{(a + 5b)(a + 2b)}$

32. (a) $x = \frac{15}{8}$

(d) $y = 0$ or 5

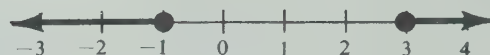
(b) $x = 8$ or -1

(e) $x = \frac{6 - p}{1 - q}$

(c) $x = -14$

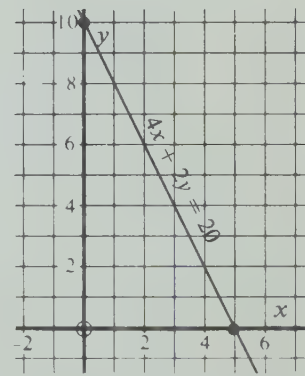
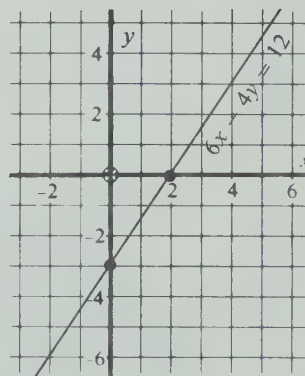
(f) $x = 1, y = -2$

33.



34. (a) x -intercept is $(2, 0)$
 y -intercept is $(0, -3)$

- (b) x -intercept is $(5, 0)$
 y -intercept is $(0, 10)$



35. (a) $\sqrt{13}$

(b) $\sqrt{5}$

(d) $\sqrt{34}$

(e) $\frac{\sqrt{170}}{5}$

(c) $2\sqrt{13} + 2\sqrt{5}$

(f) $\frac{\sqrt{170} - 0.5\sqrt{34}}{4.75}$

36. $x = 6$

37. (a) 12

(b) 13

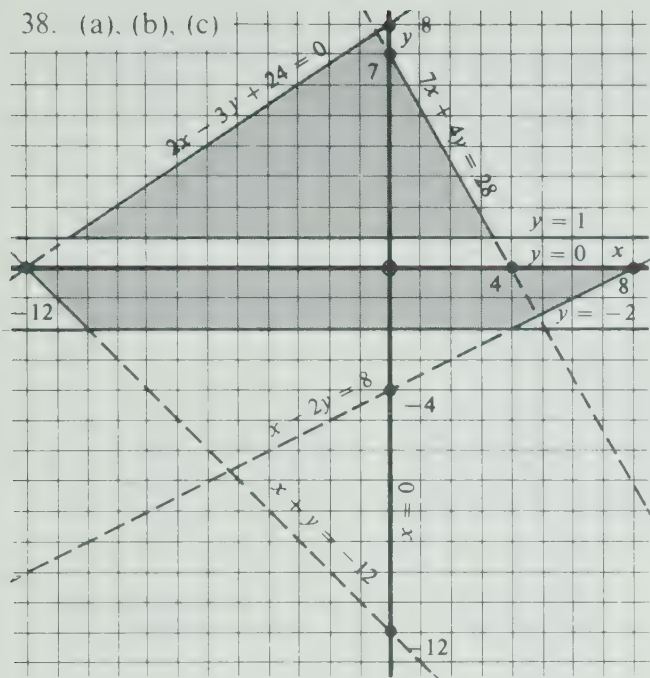
(c) $4\sqrt{10}$

(d) $\sqrt{241}$

(e) $5\sqrt{10}$

(f) w is larger by approximately 0.29.

38. (a), (b), (c)



39. (a) $27\sqrt{3}$ km, $24\sqrt{3}$ km, $27\sqrt{3}$ km

(b) $78\sqrt{3}$ km

(c) \$4.05

40. \$1.40

41. (a) 6.0×10^{-5} cm

(b) 3.66×10^4 cm

(c) 7.5×10^7 Hz

9.1 Get-Set Exercise, Page 143

1. (a) 3:4 (c) 3:1 (e) 3:1

(b) $\frac{9}{1}$ (d) $\frac{1}{3}$ (f) 1:4

2. (c), (e), (f), (h)

3. (a) $x = 6$ (e) $x = 18$

(b) $x = 20$ (f) $x = 28$

(c) $x = 20$ (g) $x = 6$

(d) $x = \frac{7}{2}$ (h) $x = 9$

4. (a) $a = 6$ (d) $l = 12$

(b) $b = 5$ (e) $f = 18$

(c) $d = 4$ (f) $h = 4$

Exercise 9.2, Page 148

3. (a) 1 (f) 5

(b) $\frac{1}{2}$ (g) $-\frac{4}{3}$

(c) -4 (h) 0

(d) $-\frac{1}{2}$ (i) 0

(e) 1 (j) Undefined (cannot divide by zero)

4. (a) 0

(b) Undefined

5. 9 m

6. 40 m

7.

10. 3

11. 1

12. $\frac{y_2 - y_1}{x_2 - x_1}$

13.

Rise	Run	Slope
3	10	$\frac{3}{10}$
2	5	$\frac{2}{5}$
6	30	$\frac{1}{5}$
$\frac{1}{2}$	8	$\frac{1}{16}$
-9	-3	3
7	$\frac{1}{2}$	14
$-\frac{9}{7}$	-3	$\frac{3}{7}$
8	4	2
$\frac{1}{3}$	$-\frac{7}{6}$	$-\frac{2}{7}$

8. 8

9. (0, -3)

Rise	Span	Pitch	Slope
4	18	$\frac{2}{9}$	$\frac{4}{9}$
2	10	$\frac{1}{5}$	$\frac{2}{5}$
4	22	$\frac{2}{11}$	$\frac{4}{11}$
5	30	$\frac{1}{6}$	$\frac{1}{3}$
6	27	$\frac{2}{9}$	$\frac{4}{9}$
10	$\frac{10}{3}$	3	6
$\frac{8}{3}$	8	$\frac{1}{3}$	$\frac{2}{3}$
28	14	2	4

Exercise 9.3, Page 154

3. (a) $\frac{2}{5}$ (e) $-\frac{4}{13}$

(b) $-\frac{9}{2}$ (f) $\frac{6}{5}$

(c) $-\frac{4}{5}$ (g) $-\frac{1}{2}$

(d) 1 (h) $\frac{2}{3}$

4. (a) $x - 2y = 0$ (f) $4x - y + 11 = 0$

(b) $3x + y - 11 = 0$ (g) $3x - y + 2 = 0$

(c) $4x + 5y + 42 = 0$ (h) $x + 2y - 6 = 0$

(d) $2x - y - 3 = 0$ (i) $y = 2$

(e) $2x - 3y - 10 = 0$ (j) $24x + 12y + 13 = 0$

5. (a) $x + y = 0$ (c) $mx - y = 0$

(b) $3x - y = 0$ (d) $y = 0$

6. (a) 0

(b) A line parallel to x axis.

(c) $y = 4$

7. (a) $x - y + 4 = 0$

(b) $3x + 2y - 4 = 0$

(c) $2x - 7y - 1 = 0$

(d) $18x - 6y - 13 = 0$

(e) $2x - y + 6 = 0$

(f) $y - y_1 = \left(\frac{y_2 - y_1}{x_2 - x_1} \right) (x - x_1)$

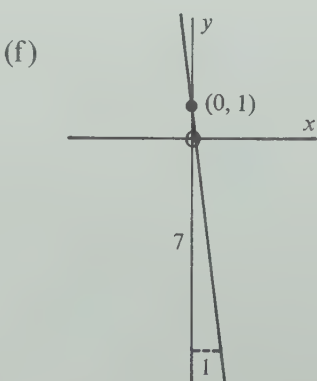
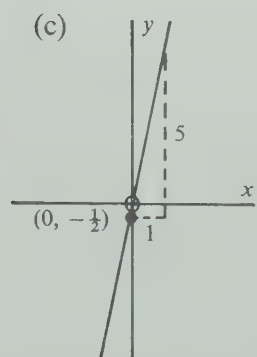
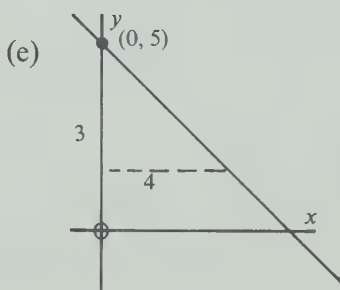
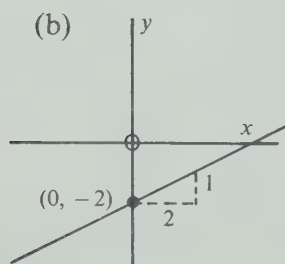
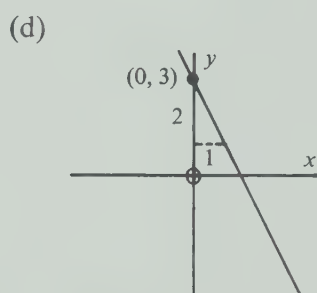
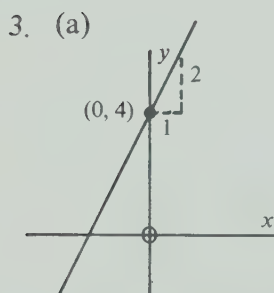
8. (a) $5x - 4y = 0$
 (b) $2x - y - 3 = 0$
 (c) $x = 4$
 (d) $3x - 4y + 8 = 0$
 (e) $y = 5$

9. (a) $x - 2y + 4 = 0$
 (b) $5x + y + 2 = 0$
 (c) $mx - y + b = 0$

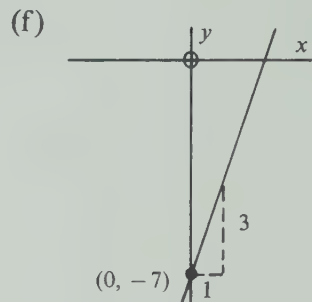
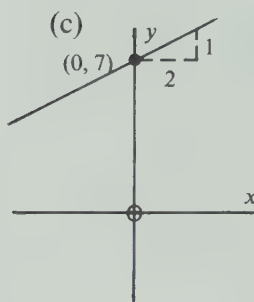
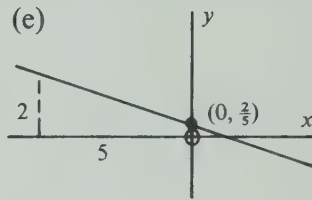
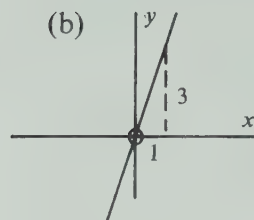
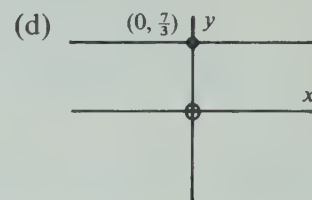
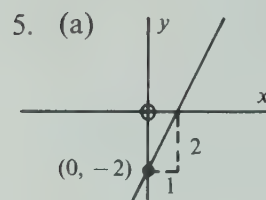
10. (a) $x + 2y - 4 = 0$
 (b) $bx + ay - ab = 0$

Exercise 9.4, Page 158

	Slope	y-intercept
(a)	2	-7
(b)	$-\frac{3}{2}$	$\frac{5}{2}$
(c)	5	-4
(d)	-1	11
(e)	-2	$\frac{3}{2}$
(f)	$\frac{2}{3}$	-2



4. (a) $y = 2x + 4$ (d) $y = -2x + 3$
 (b) $y = \frac{1}{2}x - 2$ (e) $y = -\frac{3}{4}x + 5$
 (c) $y = 5x - \frac{1}{2}$ (f) $y = -7x + 1$



6. (a) $y = -\frac{1}{2}x + 5$ (c) $y = 5x + 6$
 (b) $y = 2x - \frac{3}{4}$ (d) $y = -\frac{3}{4}x - 7$
7. (a) $y = 2x + b$ (e) $y = mx$
 (b) $y = -\frac{2}{3}x + b$ (f) $y = b$
 (c) $y = b$ (g) $y = mx$
 (d) $y = mx + 5$

8.

$y = mx + b$	Slope	y-intercept	Coordinates of one point on line
$y = \frac{1}{5}x + 2$	$\frac{1}{5}$	2	(0, 2)
$y = -3x + 7$	-3	7	(0, 7)
$y = -\frac{3}{2}x + \frac{5}{2}$	$-\frac{3}{2}$	$\frac{5}{2}$	$(0, \frac{5}{2})$
$y = -\frac{4}{3}x + 4$	$-\frac{4}{3}$	4	(0, 4)
$y = 0x + 7$	0	7	(0, 7)
$y = 2x + 0$	2	0	(0, 0)

Exercise 10.1, Page 165

1. (a)	Voltage	8	12	$\frac{40}{3}$	16	24	32
	Current	6	9	10	12	18	24

$$k = \frac{4}{3}$$

(b)	Area	8	56	80	120	64	808	1632
	Width	1	7	10	15	8	101	204

$$k = 8$$

(c)

Circumference	6.2	15.5	27.9	31.0	37.2	55.8
Diameter	2	5	9	10	12	18

$$k = 3.1$$

2. (a)	Cost	3	12	$\frac{17}{2}$	15	24	33	66	123	150
	No. of guests	2	8	9	10	16	22	44	82	100

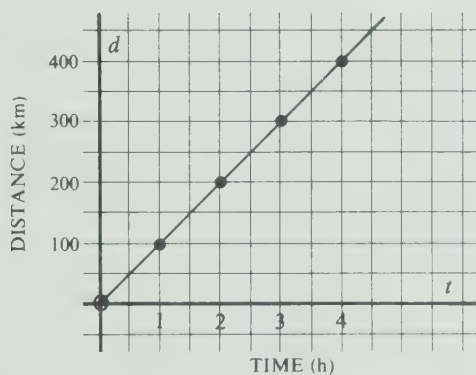
(b)	Distance	4	8	16	32	64	128
	Time	1	2	4	8	16	32

(c)	Interest	5	7.5	15	30	75	150
	Amount owed	100	150	300	600	1500	3000

3. (a) $A = kr^2$
 (b) $t = k\sqrt{I}$

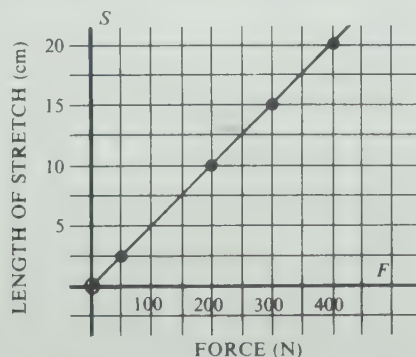
(c) $v = kgh^2$

4. $d = 100t$



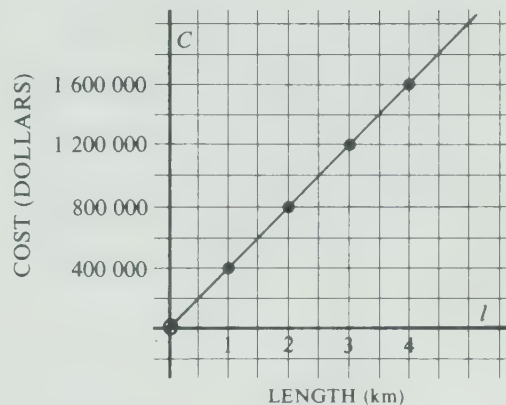
Distance travelled in 3.5 h = 350 km

5. $S = 0.05 F$



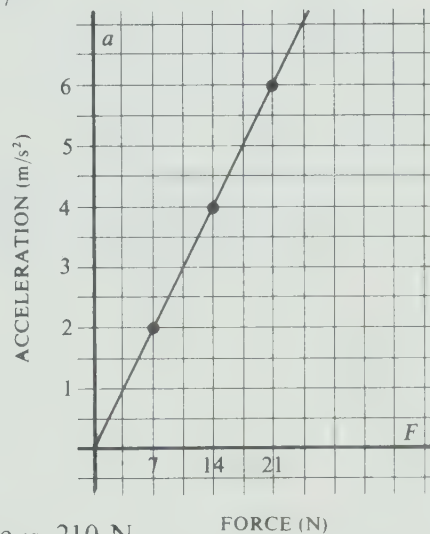
When Force = 300 N, Stretch = 15 cm

6. (a) 9
 (b) 1
 (c) 15
 (d) $C = \frac{1}{3}n$
7. (a) \$23 000 000
 (b) $C = 400\,000\,l$



(c) 87.5 km

8. $a = \frac{2}{7}F$



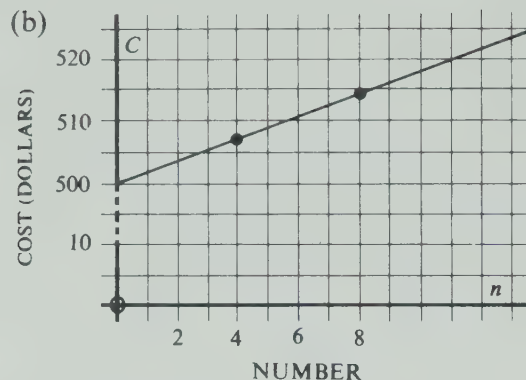
Force = 210 N

9. $l_s = 0.8l_o$
10. $833\frac{1}{3}$ units; $r = \frac{50}{9}s$
11. 22 Ω
12. (a) 21.7 cm
 (b) 20 cm
 (c) 4 cm
 (d) $c = 3.1d$
13. \$13.50; $I = 4.5m$
14. 133.9 cm³

Exercise 10.2, Page 171

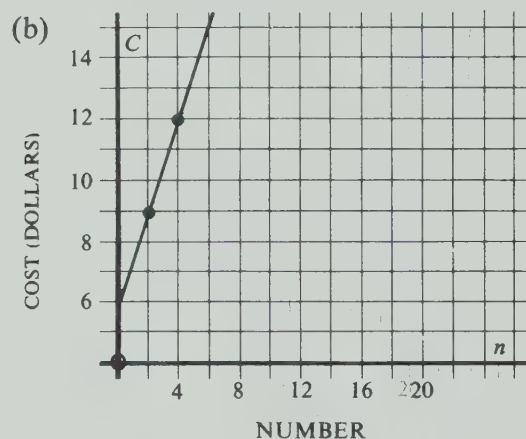
1. (c) $C = kn + K$
 (d) $y = kx^2 + K$
 (e) $C = ks + K$

2. (a) $C = 1.75n + 500$



(c) \$2425

3. (a) $C = 1.50n + 6$



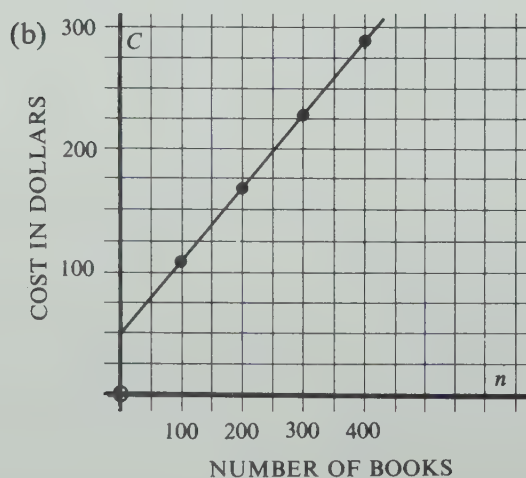
(c) \$36.00

4. \$260; \$20

5. $C = 100 + 2N$; \$340

6. 78.2 kg

7. (a) $C = 0.60n + 46.50$



(c) \$262.50

8. \$345

9. $y = \frac{9}{2} + \frac{3}{2}x$

10. 96 min; 240 km

Exercise 10.3, Page 175

4. $F = \frac{k}{d^2}$; $\frac{10}{9}$ units

6. 160 units

5. $V = \frac{k}{p}$; $31\frac{2}{3}$ l

7. 8 teeth

Exercise 11.1, Page 179

3. (a) 8

(f) 6

(b) 8

(g) 4

(c) 9

(h) 10

(d) 12

(i) 9

(e) 7

(j) 6

4.

Coordinates of Point A	Coordinates of Point B	Coordinates of Point C	Parallel Axis	Length of AB and AC
(2, 4)	(2, 12)	(2, -4)	y axis	8
(-2, 5)	(-9, 5)	(5, 5)	x axis	7
(3, -1)	(3, 10)	(3, -12)	y axis	11
(4, 7)	(1, 7)	(7, 7)	x axis	3
(1, -1)	(-4, -1)	(6, -1)	x axis	5
(5, -8)	(5, -2)	(5, -14)	y axis	6
(0, 4)	(0, 13)	(0, -5)	y axis	9

Exercise 11.2, Page 183

1. (a) $\sqrt{(-3)^2 + (-4)^2}$ (e) $\sqrt{8^2 + 18^2}$

(b) $\sqrt{(-5)^2 + (-12)^2}$ (f) $\sqrt{5^2 + (-6)^2}$

(c) $\sqrt{8^2 + 6^2}$ (g) $\sqrt{7^2 + (-8)^2}$

(d) $\sqrt{(-10)^2 + (-7)^2}$ (h) $\sqrt{12^2 + (-4)^2}$

2. (a) $2\sqrt{26}$ (d) 2

(b) $\sqrt{82}$ (e) 10

(c) $4\sqrt{2}$ (f) $\sqrt{130}$

3. (a) $15 + \sqrt{137}$

(b) 18

4. ± 3

5. ± 12

6. $OA = OB = OC = OD$

Exercise 11.3, Page 188

1.	Line Segment	Midpoint
(a)	AB	$(3\frac{1}{2}, 3)$
	CD	$(5, -2\frac{1}{2})$
	EF	$(-3, -2)$
	GH	$(-3, 2)$
(b)	AB	$(2, 3\frac{1}{2})$
	CD	$(4, 3)$
	EF	$(4, -1)$
	GH	$(5, -2)$
	KL	$(-2, -2)$
	MN	$(-4, -2)$
	PQ	$(-4, 2)$
	RS	$(-\frac{5}{2}, 5)$
(c)	AB	$(1, 4)$
	CD	$(4, -1)$
	EF	$(2, -\frac{1}{2})$
	GH	$(-\frac{1}{2}, -1)$
	KL	$(-4, -\frac{1}{2})$
(d)	AB	$(0, 3)$
	CD	$(\frac{3}{2}, 0)$
	EF	$(-\frac{1}{2}, -\frac{3}{2})$
(e)	AB	$(0, \frac{3}{2})$
	CD	$(\frac{3}{2}, 0)$
	EF	$(\frac{3}{2}, 1)$
(f)	AB	$(\frac{3}{2}, \frac{5}{2})$
	CD	$(-3, -\frac{1}{2})$
	EF	$(1, -2)$

2. (a) $(\frac{5}{2}, -\frac{9}{2})$

(b) $(1, 5)$

(c) $(-4, -2)$

(d) $(-4, -3)$

(e) $(\frac{a+c}{2}, \frac{b+d}{2})$

(f) $(\frac{3a}{8}, \frac{7b}{20})$

3. (a)	Side	Midpoint
(i)	AB	$(2, -3)$
	BC	$(5, 1)$
	CA	$(1, 1)$
(ii)	JK	$(\frac{1}{2}, 8)$
	KL	$(4, 14)$
	LJ	$(\frac{3}{2}, 8)$

(b)	Vertex	Opposite side	Median length
(i)	A	BC	$\sqrt{65}$
	B	CA	$\sqrt{41}$
	C	AB	$\sqrt{68}$
(ii)	J	KL	12
	K	LJ	$\frac{3}{2}\sqrt{41}$
	L	JK	$\frac{3}{2}\sqrt{41}$

4. (a) Bisects at $(0, -3)$

(b) Bisects at $(\frac{3}{2}, 0)$

5. $(0, 0)$

7. (a) Midpoint of AC is $(-4, -2)$.
Midpoint of AB is $(-2, -3)$.

8. $(-3, 4)$

9. $(3, 7)$

10. $(-3, 0)$

11. $(1, -7)$

Exercise 12.1, Page 193

1.

	Equation	Domain	Range
(a)	$x^2 + y^2 = 81$	$\{x \mid -9 \leq x \leq 9\}$	$\{y \mid -9 \leq y \leq 9\}$
(b)	$x^2 + y^2 = 5$	$\{x \mid -\sqrt{5} \leq x \leq \sqrt{5}\}$	$\{y \mid -\sqrt{5} \leq y \leq \sqrt{5}\}$
(c)	$x^2 + y^2 = \frac{4}{9}$	$\{x \mid -\frac{2}{3} \leq x \leq \frac{2}{3}\}$	$\{y \mid -\frac{2}{3} \leq y \leq \frac{2}{3}\}$
(d)	$x^2 + y^2 = 20$	$\{x \mid -2\sqrt{5} \leq x \leq 2\sqrt{5}\}$	$\{y \mid -2\sqrt{5} \leq y \leq 2\sqrt{5}\}$
(e)	$x^2 + y^2 = 1$	$\{x \mid -1 \leq x \leq 1\}$	$\{y \mid -1 \leq y \leq 1\}$
(f)	$x^2 + y^2 = \frac{1}{81}$	$\{x \mid -\frac{1}{9} \leq x \leq \frac{1}{9}\}$	$\{y \mid -\frac{1}{9} \leq y \leq \frac{1}{9}\}$

	Radius	Domain	Range
(a)	6	$\{x \mid -6 \leq x \leq 6\}$	$\{y \mid -6 \leq y \leq 6\}$
(b)	$\sqrt{5}$	$\{x \mid -\sqrt{5} \leq x \leq \sqrt{5}\}$	$\{y \mid -\sqrt{5} \leq y \leq \sqrt{5}\}$
(c)	1	$\{x \mid -1 \leq x \leq 1\}$	$\{y \mid -1 \leq y \leq 1\}$
(d)	$\frac{2}{3}$	$\{x \mid -\frac{2}{3} \leq x \leq \frac{2}{3}\}$	$\{y \mid -\frac{2}{3} \leq y \leq \frac{2}{3}\}$
(e)	$\frac{1}{2}$	$\{x \mid -\frac{1}{2} \leq x \leq \frac{1}{2}\}$	$\{y \mid -\frac{1}{2} \leq y \leq \frac{1}{2}\}$
(f)	$\frac{3}{2}$	$\{x \mid -\frac{3}{2} \leq x \leq \frac{3}{2}\}$	$\{y \mid -\frac{3}{2} \leq y \leq \frac{3}{2}\}$
(g)	2	$\{x \mid -2 \leq x \leq 2\}$	$\{y \mid -2 \leq y \leq 2\}$
(h)	4	$\{x \mid -4 \leq x \leq 4\}$	$\{y \mid -4 \leq y \leq 4\}$
(i)	$2\sqrt{\frac{3}{7}}$	$\{x \mid -2\sqrt{\frac{3}{7}} \leq x \leq 2\sqrt{\frac{3}{7}}\}$	$\{y \mid -2\sqrt{\frac{3}{7}} \leq y \leq 2\sqrt{\frac{3}{7}}\}$
(j)	$\frac{\sqrt{3}}{4}$	$\{x \mid -\frac{\sqrt{3}}{4} \leq x \leq \frac{\sqrt{3}}{4}\}$	$\{y \mid -\frac{\sqrt{3}}{4} \leq y \leq \frac{\sqrt{3}}{4}\}$

3. (a) $\sqrt{x^2 + y^2} = 6$ the set of points at distance 6 units from the origin
 (f) $\sqrt{x^2 + y^2} = \frac{3}{2}$

(b) $\sqrt{x^2 + y^2} = \sqrt{5}$ (g) $\sqrt{x^2 + y^2} = 2$
 (c) $\sqrt{x^2 + y^2} = 1$ (h) $\sqrt{x^2 + y^2} = 4$

(d) $\sqrt{x^2 + y^2} = \frac{2}{3}$ (i) $\sqrt{x^2 + y^2} = 2\sqrt{\frac{3}{7}}$

(e) $\sqrt{x^2 + y^2} = \frac{1}{2}$ (j) $\sqrt{x^2 + y^2} = \frac{\sqrt{3}}{4}$

4. (a) $x^2 + y^2 = 25$ (e) $x^2 + y^2 = 100$
 (b) $x^2 + y^2 = 7$ (f) $x^2 + y^2 = 25$
 (c) $x^2 + y^2 = 5$ (g) $x^2 + y^2 = 9$
 (d) $x^2 + y^2 = 4$ (h) $x^2 + y^2 = 64$

5. (a) $x^2 + y^2 = 25$ (d) $x^2 + y^2 = 61$
 (b) $x^2 + y^2 = 29$ (e) $x^2 + y^2 = 34$
 (c) $x^2 + y^2 = 10$ (f) $x^2 + y^2 = 74$

Exercise 12.2, Page 195

6. (a) (3, 8)
 (b) 4
 (c) $(x - 3)^2 + (y - 4)^2 = 16$

7. (a) (0, 2)
 (b) 3
 (c) $(x + 3)^2 + (y - 2)^2 = 9$

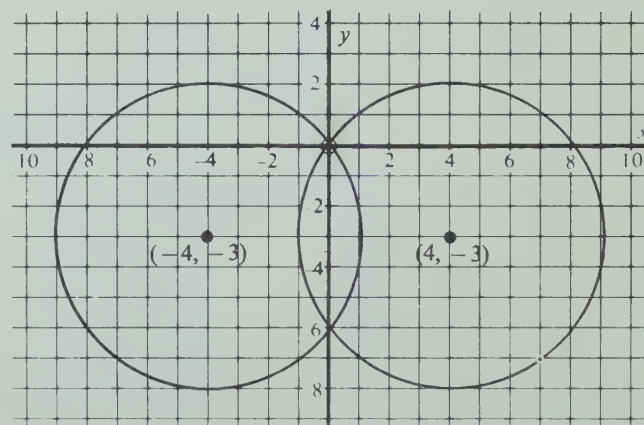
8. $(x - 2)^2 + (y + 4)^2 = 25$

9. $(x + 5)^2 + (y + 7)^2 = 9$

10. (a) (3, -5)
 (b) $\sqrt{8}$
 (c) $(x - 3)^2 + (y + 5)^2 = 8$

11. (a) $(x - 2)^2 + (y - 3)^2 = 52$
 (b) $(x + 3)^2 + (y - 1)^2 = 5$

12. (a) $\sqrt{x^2 + 9} = 5$
 (b) $x = \pm 4$
 (c)

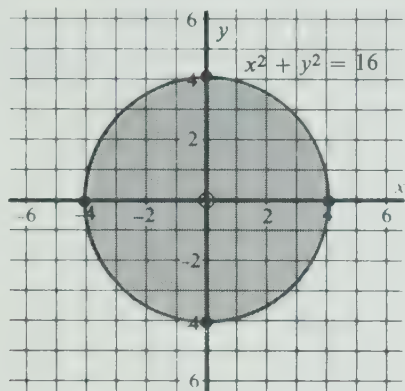


13. (a) $\sqrt{(x + 1)^2 + 1} = \sqrt{x^2 + 4}$
 (b) $x = 1$
 (c) $\sqrt{5}$
 (d) $(x - 1)^2 + y^2 = 5$

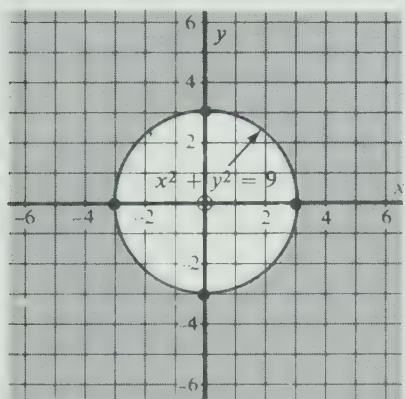
Exercise 12.3, Page 199

1. (a) interior (f) on
(b) exterior (g) exterior
(c) exterior (h) on
(d) exterior (i) on
(e) exterior (j) interior

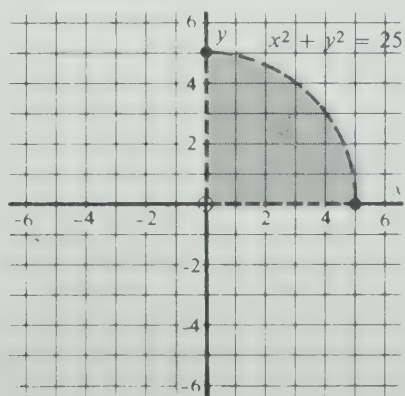
2. (a) $\{(x, y) \mid x^2 + y^2 \leq 16\}$
Centre = (0, 0) Radius = 4



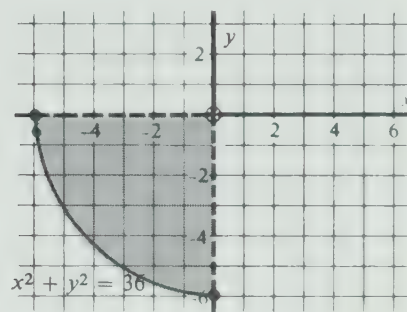
- (b) $\{(x, y) \mid (x^2 + y^2 \geq 9)\}$
Centre = (0, 0) Radius = 3



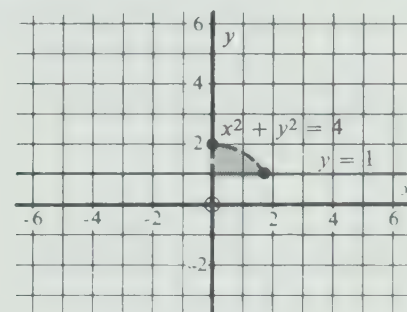
- (c) $\{(x, y) \mid x^2 + y^2 < 25, x > 0, y > 0\}$



- (d) $\{(x, y) \mid x^2 + y^2 \leq 36, x < 0, y < 0\}$
Centre = (0, 0) Radius = 6



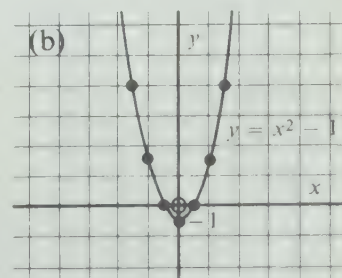
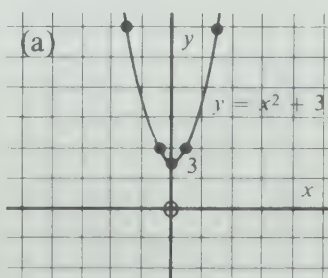
- (e) $\{(x, y) \mid x^2 + y^2 < 4, x > 0, y \geq 1\}$

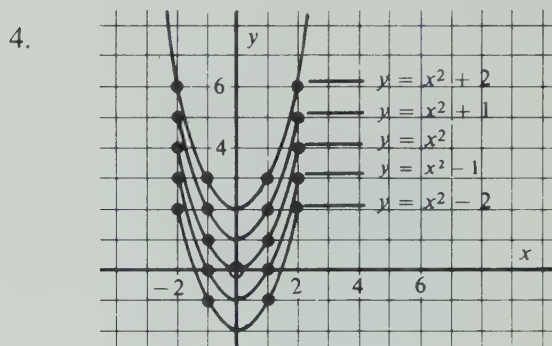
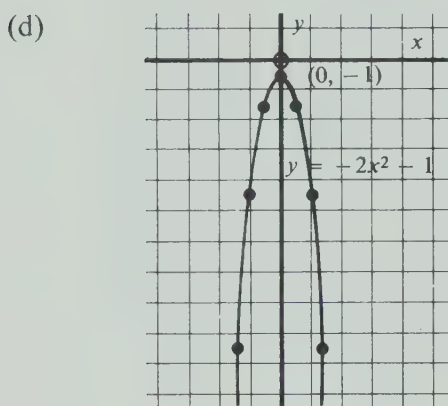
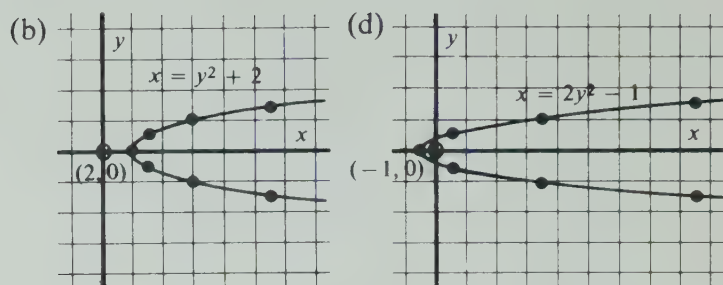
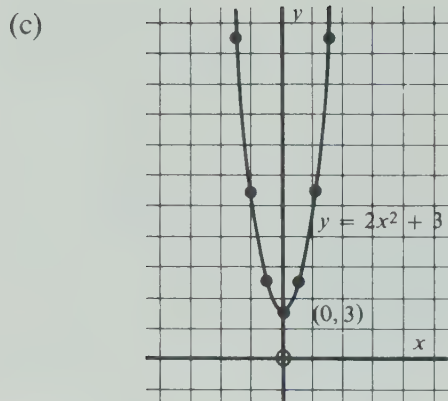


3. (a) $(x - 1)^2 + (y - 2)^2 = 16$
(b) $(x - 1)^2 + (y - 2)^2 < 16$
(c) $(x - 1)^2 + (y - 2)^2 > 16$
4. (a) $\{(x, y) \mid x^2 + y^2 \leq 25, y \leq 0\}$
(b) $\{(x, y) \mid x^2 + y^2 \leq 9, x \geq -2\}$
(c) $\{(x, y) \mid x^2 + y^2 \leq 25, x^2 + y^2 \geq 4\}$
(d) $\{(x, y) \mid x^2 + y^2 < 25, y < x\}$

Exercise 12.4, Page 203

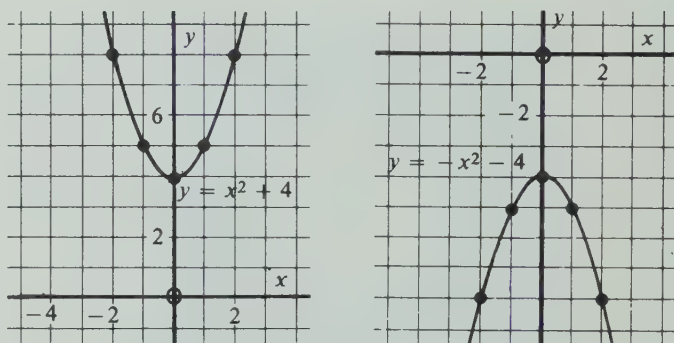
1. x	$x^2 + 3$	$x^2 - 1$	$2x^2 + 3$	$-2x^2 - 1$
-3	12	8	21	-19
-2	7	3	11	-9
-1	4	0	5	-3
0	3	-1	3	-1
1	4	0	5	-3





- (a) a parabola
 (b) $(0, 1)$, $(0, 2)$, $(0, 0)$, $(0, -1)$, $(0, -2)$
 (c) It shifts the parabola up or down, parallel to the y axis.

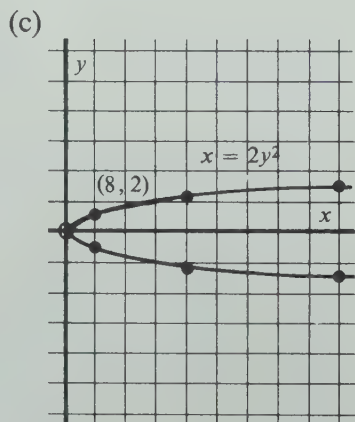
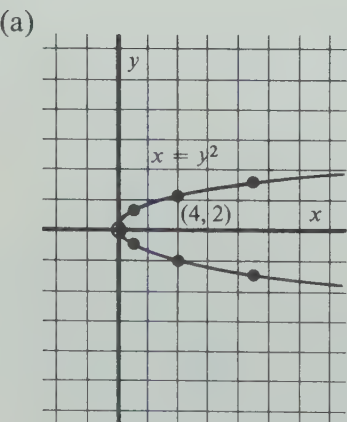
5.



- (a) $y = x^2 + 4$ opens up; $y = -x^2 - 4$ opens down
 (b) $(0, 4)$, $(0, -4)$

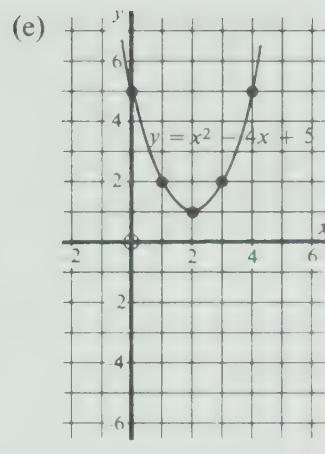
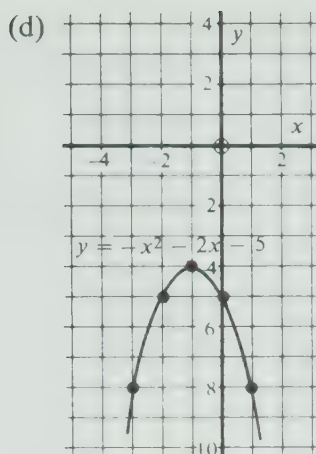
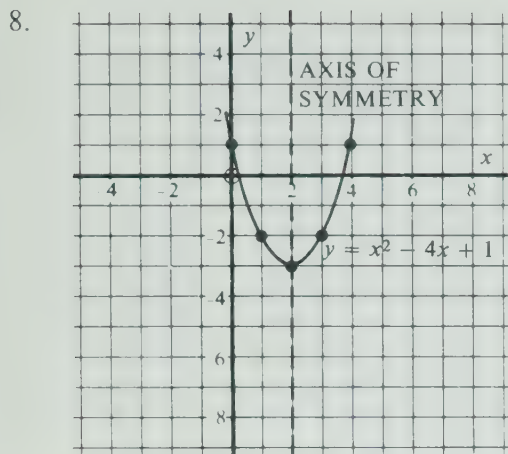
3.

y	y^2	$y^2 + 2$	$2y^2$	$2y^2 - 1$
-3	9	11	18	17
-2	4	6	8	7
-1	1	3	2	1
0	0	2	0	-1
1	1	3	2	1



	Domain	Range
(c) $y = x^2 + 4$	$\{x x \in \mathbb{R}\}$	$\{y y \geq 4\}$
$y = -x^2 - 4$	$\{x x \in \mathbb{R}\}$	$\{y y \leq -4\}$

6. (a) $c = 0$
 (b) $c < 0$
 (c) $c > 0$
7. (a) $c = 0$
 (b) $c > 0$
 (c) $c < 0$



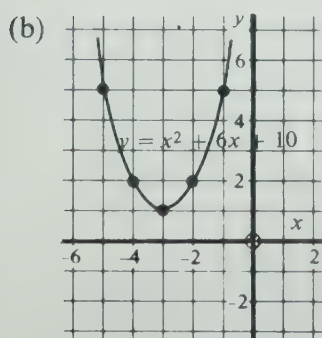
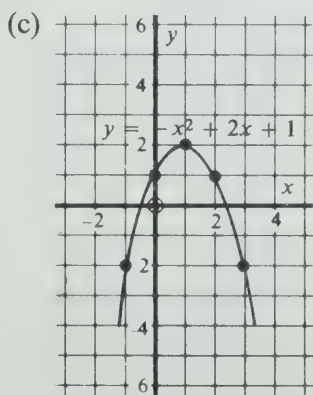
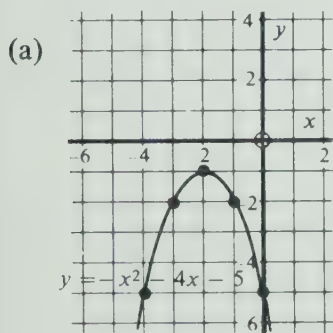
- (a) 2, -3
 (b) $x - 2 = 0$
 (c) $\{x | x \in R\}, \{y | y \geq -3\}$

MBS Exercise 3, Page 205

1. (a) $\frac{1}{2}$ (c) -1
 (b) 2 (d) $\frac{2}{5}$
 2. (a) 3 (d) -1 (g) $-\frac{5}{6}$
 (b) -4 (e) 0 (h) 4
 (c) 3 (f) -4 (i) $\frac{2}{3}$

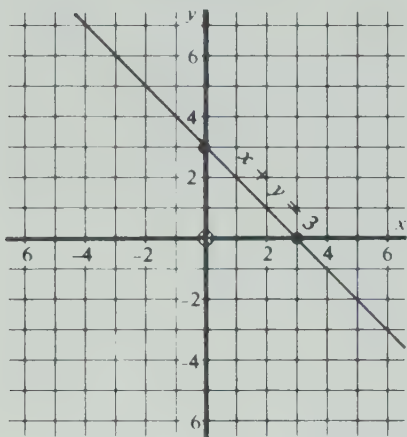
	Vertex	Axis of Symmetry	Domain	Range
(a)	$(-2, -1)$	$x + 2 = 0$	$\{x x \in R\}$	$\{y y \leq -1\}$
(b)	$(-3, 1)$	$x + 3 = 0$	$\{x x \in R\}$	$\{y y \geq 1\}$
(c)	$(1, 2)$	$x - 1 = 0$	$\{x x \in R\}$	$\{y y \leq 2\}$
(d)	$(-1, -4)$	$x + 1 = 0$	$\{x x \in R\}$	$\{y y \leq -4\}$
(e)	$(2, 1)$	$x - 2 = 0$	$\{x x \in R\}$	$\{y y \geq 1\}$

3. (a) $y = 5$ (c) $y = -2$
 (b) $x = 2$ (d) $x = -4$
 4. (a) $y = 6$ (e) $y = 0$
 (b) $x = 6$ (f) $y = 7$
 (c) $y = -3$ (g) $x = 0$
 (d) $x = -2$

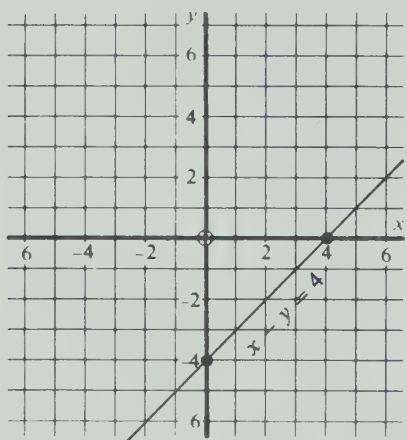


5. (a) $y = 3x$ or $3x - y = 0$
 (b) $y = -2x$ or $2x + y = 0$
 (c) $y = \frac{4}{5}x$ or $4x - 5y = 0$
 (d) $y = -\frac{3}{7}x$ or $3x + 7y = 0$
 6. (a) $2x - y = -1$ (e) $2x - 3y = 4$
 (b) $5x + y = 15$ (f) $3x + 5y = -3$
 (c) $3x - y = 20$ (g) $3x + 4y = -11$
 (d) $4x + y = -15$ (h) $y = 1$
 7. (a) $5x - 3y = 0$ (c) $y = 0$
 (b) $2x + y = 0$ (d) $y = 0$
 8. (a) $2x - 5y = 0$ (c) $x - y = -3$
 (b) $2x - y = -2$ (d) $2x + y = -4$
 9. (a) $2x - y = -2$ (d) $x - y = -4$
 (b) $3x - y = 8$ (e) $2x - 3y = -13$
 (c) $x + y = 7$ (f) $3x - 2y = 11$
 10. (a) 3 (d) -4
 (b) -4 (e) $-\frac{1}{7}$
 (c) $\frac{7}{2}$ (f) $\frac{2}{3}$

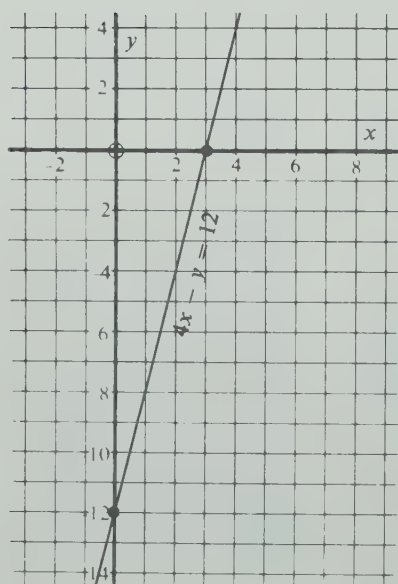
11. (a) x -intercept = 3
 y -intercept = 3



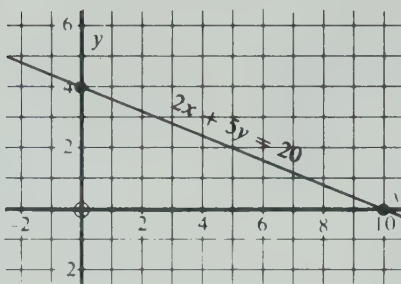
- (b) x -intercept = 4
 y -intercept = -4



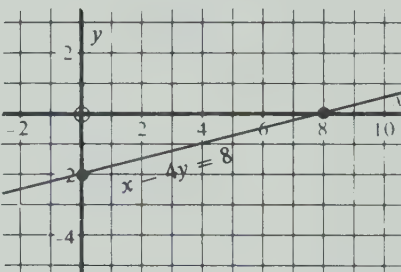
- (c) x -intercept = 3
 y -intercept = -12



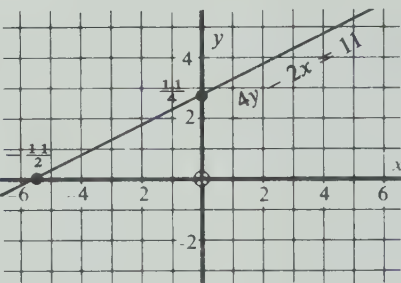
- (d) x -intercept = 10
 y -intercept = 4



- (e) x -intercept = 8
 y -intercept = -2



- (f) x -intercept = $-\frac{11}{2}$
 y -intercept = $\frac{11}{4}$



15. (a) $3x - y = -5$
 (b) $4x - y = 28$
 (c) $x + y = 2$
 (d) $2x + 3y = 8$

16. (a) (4, 3) (c) (2, 3)
 (b) (3, 5) (d) (1, -2)
17. (a) (3, 3) (e) $(2, \frac{15}{2})$
 (b) (-2, 1) (f) $(\frac{11}{2}, \frac{9}{2})$
 (c) (5, 5) (g) (-1, -1)
 (d) (1, 3) (h) $(\frac{15}{2}, -\frac{11}{2})$

18. (a) 10 (c) 5
 (b) 5 (d) 13

19. (a) 8 (e) 13
 (b) 7 (f) 10
 (c) 8 (g) 13
 (d) 5 (h) $\sqrt{13}$

20. (a) 5 (e) $3\sqrt{5}$
 (b) $4\sqrt{2}$ (f) 5
 (c) 13 (g) $\sqrt{29}$
 (d) $\sqrt{13}$ (h) $\sqrt{5}$

21. (a) $a = 8$
 (b) $b = \pm 6$
 (c) $a = \pm 12$
 (d) $y = 15$ or $y = 1$

22. (a) $x^2 + y^2 = 25$
 (b) $x^2 + y^2 - 8x - 8y + 16 = 0$
 (c) $x^2 + y^2 + 10x - 6y + 9 = 0$
 (d) $x^2 + y^2 - 14x - 16y + 97 = 0$

12. Point of intersection

	with x axis	with y axis
(a)	$(\frac{4}{3}, 0)$	$(0, -4)$
(b)	$(6, 0)$	$(0, -4)$
(c)	$(2, 0)$	$(0, 8)$
(d)	$(6, 0)$	$(0, 10)$
(e)	$(-5, 0)$	$(0, \frac{5}{2})$
(f)	$(\frac{9}{2}, 0)$	$(0, -\frac{9}{5})$
(g)	$(\frac{5}{3}, 0)$	$(0, \frac{5}{2})$
(h)	$(\frac{1}{2}, 0)$	$(0, -\frac{1}{4})$

13. (a) $y = 3$ (c) $y = -5$
 (b) $y = 1$ (d) $y = 2$
14. (a) $7x + y = 28$ (c) $x + y = -2$
 (b) $x - y = -3$ (d) $x + 4y = -12$

23.

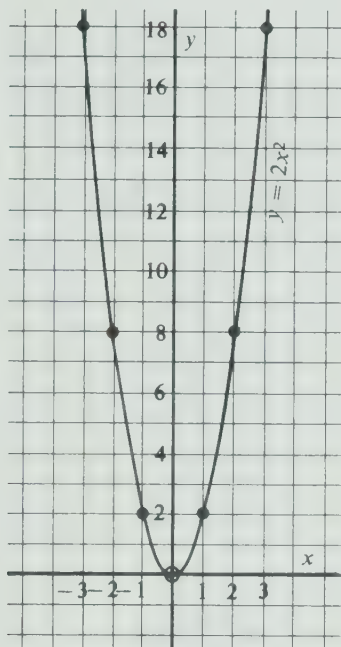
	Radius	Centre
(a)	3	(0, 0)
(b)	$\sqrt{3}$	(0, 0)
(c)	5	(2, 4)
(d)	3	(-3, 1)
(e)	$\sqrt{3}$	(1, -2)
(f)	$\sqrt{7}$	(-5, -3)

24. (a) $(x - 2)^2 + (y - 5)^2 = 9$
or $x^2 + y^2 - 4x - 10y + 20 = 0$
(b) $(x + 3)^2 + (y - 8)^2 = 16$
or $x^2 + y^2 + 6x - 16y + 57 = 0$
(c) $(x + 4)^2 + (y + 3)^2 = 1$
or $x^2 + y^2 + 8x + 6y + 24 = 0$
(d) $(x - 8)^2 + (y + 4)^2 = 5$
or $x^2 + y^2 - 16x + 8y + 75 = 0$

25. (a)

(ii)

(i)	x	y
	-3	18
	-2	8
	-1	2
	0	0
	1	2
	2	8
	3	18



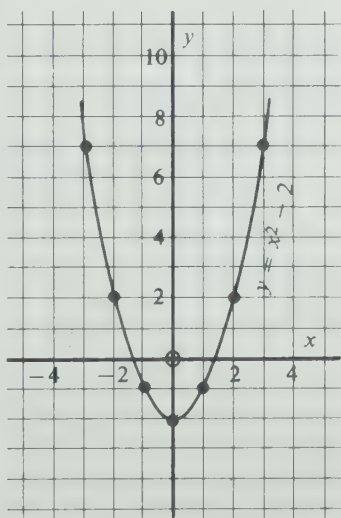
(iii) Vertex : (0, 0)

(iv) Axis of symmetry : $x = 0$

25. (b)

(ii)

(i)	x	y
	-3	7
	-2	2
	-1	-1
	0	-2
	1	-1
	2	2
	3	7



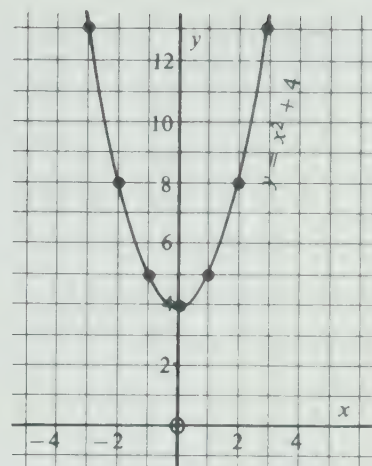
(iii) Vertex : (0, -2)

(iv) Axis of symmetry : $x = 0$

25. (c)

(ii)

(i)	x	y
	-3	13
	-2	8
	-1	5
	0	4
	1	5
	2	8
	3	13



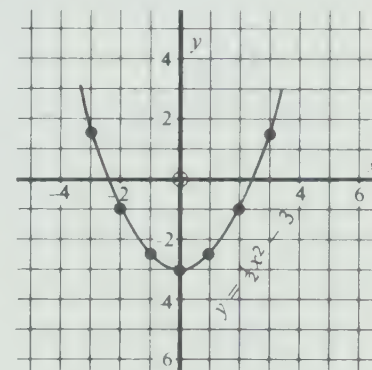
(iii) Vertex : (0, 4)

(iv) Axis of symmetry : $x = 0$

25. (d)

(ii)

(i)	x	y
	-3	$1\frac{1}{2}$
	-2	-1
	-1	$-2\frac{1}{2}$
	0	-3
	1	$-2\frac{1}{2}$
	2	-1
	3	$1\frac{1}{2}$



(iii) Vertex : (0, -3)

(iv) Axis of symmetry : $x = 0$

26. (a) $\{(x, y) | x^2 + y^2 \leq 25\}$
(b) $\{(x, y) | x^2 + y \leq 49 \cap y \geq 0\}$
(c) $\{(x, y) | x^2 + y^2 \leq 16 \cap x + 2y > 0\}$
(d) $\{(x, y) | x^2 + y^2 \leq 25 \cap x^2 + y^2 \geq 4\}$

27. (a) $a = 7b$

(b) $a = 28$

28. (a) $c = 5h$

(b) $c = 15$

29. (a) $mn = 20$

(b) $m = 4$

30. (a) $A = 5 + 3B$

(b) $A = 20$

31. (a) $x = ky, k = 3$

(b) $x = 12$

(c) $x = 24$

(d) $y = 7$

32. (a) $r = ks, k = \frac{1}{2}$

(b) $r = 20$

(c) $r = 4$

(d) $s = 14$

33. (a) $k = 5, x = 5y^2$

(b) $x = 45 \text{ m}^2$

(c) $x = 35 \text{ m}^2$

(d) $x = 0.8 \text{ m}^2$

34. (a) $T = 0.2\sqrt{l}$

(b) 1.0 s

(c) 0.8 s

(d) 56 cm

Exercise 13.1, Page 213

2. (a) $x^\circ = 45^\circ$
 $y^\circ = 135^\circ$
 $z^\circ = 135^\circ$
- (b) $x^\circ = 30^\circ$
 $y^\circ = 60^\circ$
 $z^\circ = 90^\circ$
 $m^\circ = 150^\circ$
- (c) $x^\circ = 30^\circ$
 $y^\circ = 75^\circ$
 $z^\circ = 150^\circ$
- (d) $x^\circ = 50^\circ$
 $y^\circ = 30^\circ$
- (e) $x^\circ = 45^\circ$
- (f) $m^\circ = 30^\circ$
- (g) $a^\circ = 75^\circ$
 $b^\circ = 120^\circ$
 $c^\circ = 45^\circ$
- (h) $x^\circ = 30^\circ$
 $y^\circ = 90^\circ$
- (i) $x^\circ = 35^\circ$
 $y^\circ = 70^\circ$
 $z^\circ = 55^\circ$

- (c) $x^\circ = 70^\circ$
 $y^\circ = 110^\circ$
 $z^\circ = 30^\circ$
 $a^\circ = 30^\circ$
 $b^\circ = 150^\circ$
- (d) $x^\circ = 62^\circ$
 $y^\circ = 106^\circ$
- (e) $a^\circ = 25^\circ$
 $b^\circ = 85^\circ$
 $c^\circ = 85^\circ$
- (f) $x^\circ = 44^\circ$
 $y^\circ = 64^\circ$
 $z^\circ = 72^\circ$
- (i) $x^\circ = 60^\circ$
 $y^\circ = 60^\circ$
 $z^\circ = 120^\circ$
- (j) $x^\circ = 28^\circ$
 $y^\circ = 28^\circ$
 $z^\circ = 124^\circ$
- (k) $x^\circ = 54^\circ$
 $y^\circ = 63^\circ$
 $z^\circ = 63^\circ$
 $a^\circ = 63^\circ$
 $b^\circ = 63^\circ$

Exercise 13.2, Page 216

2. (a) $x^\circ = 20^\circ$
 $y^\circ = 40^\circ$
 $z^\circ = 40^\circ$
- (b) $x^\circ = 60^\circ$
 $z^\circ = 90^\circ$
- (c) $x^\circ = 60^\circ$
 $y^\circ = 60^\circ$
 $z^\circ = 60^\circ$
 $n^\circ = 60^\circ$
 $m^\circ = 30^\circ$
- (d) $x^\circ = 40^\circ$
 $y^\circ = 130^\circ$
- (e) $x^\circ = 30^\circ$
 $y^\circ = 30^\circ$
 $z^\circ = 120^\circ$
- (f) $x^\circ = 52^\circ$
 $y^\circ = 30^\circ$
 $z^\circ = 30^\circ$
 $m^\circ = 98^\circ$
- (g) $x^\circ = 26^\circ$
 $y^\circ = 39^\circ$
- (h) $x^\circ = 50^\circ$
 $y^\circ = 100^\circ$
 $z^\circ = 40^\circ$
 $m^\circ = 40^\circ$
- (i) $x^\circ = 40^\circ$
 $y^\circ = 40^\circ$
 $m^\circ = 50^\circ$
 $n^\circ = 50^\circ$
- (j) $x^\circ = 70^\circ$
 $y^\circ = 20^\circ$
 $z^\circ = 140^\circ$
 $w^\circ = 40^\circ$
- (k) $x^\circ = 60^\circ$
 $y^\circ = 30^\circ$
 $z^\circ = 60^\circ$

Exercise 13.5, Page 223

1. $x^\circ = 50^\circ$
 $y^\circ = 45^\circ$
 $z^\circ = 85^\circ$
 $m^\circ = 85^\circ$
2. $x^\circ = 40^\circ$
 $y^\circ = 110^\circ$
 $z^\circ = 40^\circ$
 $m^\circ = 30^\circ$
3. $x^\circ = 30^\circ$
 $y^\circ = 120^\circ$
 $z^\circ = 60^\circ$
 $m^\circ = 60^\circ$
 $n^\circ = 60^\circ$
4. $x^\circ = 40^\circ$
 $y^\circ = 40^\circ$
 $z^\circ = 50^\circ$
 $m^\circ = 80^\circ$
 $n^\circ = 50^\circ$
5. $x^\circ = 30^\circ$
 $y^\circ = 40^\circ$
 $m^\circ = 60^\circ$
 $n^\circ = 80^\circ$
6. $a^\circ = 60^\circ$
 $b^\circ = 80^\circ$
 $c^\circ = 80^\circ$
 $d^\circ = 100^\circ$
 $e^\circ = 100^\circ$
 $f^\circ = 60^\circ$
 $x^\circ = 30^\circ$
 $y^\circ = 40^\circ$
 $z^\circ = 50^\circ$

Exercise 13.4, Page 220

4. (a) $x^\circ = 35^\circ$
 $y^\circ = 85^\circ$
 $z^\circ = 85^\circ$
 $m^\circ = 60^\circ$
- (b) $a^\circ = 74^\circ$
 $b^\circ = 74^\circ$
 $c^\circ = 74^\circ$
 $d^\circ = 74^\circ$
- (g) $x^\circ = 38^\circ$
 $y^\circ = 68^\circ$
 $z^\circ = 68^\circ$
 $t^\circ = 74^\circ$
- (h) $x^\circ = 90^\circ$
 $y^\circ = 48^\circ$
 $z^\circ = 42^\circ$

7. $a^\circ = 20^\circ$
 $b^\circ = 25^\circ$
 $c^\circ = 90^\circ$
8. (a) $\angle XAO = 90^\circ$
 (b) $\angle XAB = 70^\circ$
 $a^\circ = 140^\circ$
 $b^\circ = 20^\circ$
 $c^\circ = 20^\circ$
9. (a) $\angle XAO = 90^\circ$
 (b) $\angle XAB = 62^\circ$
 $a^\circ = 28^\circ$
 $b^\circ = 28^\circ$
 $y^\circ = 124^\circ$
10. $x^\circ = 18^\circ$
 $y^\circ = 18^\circ$
 $a^\circ = 72^\circ$
11. $a^\circ = 40^\circ$
 $b^\circ = 60^\circ$
 $c^\circ = 80^\circ$
2. (a) 25 kg (c) $4\frac{1}{6}$ kg (e) 100 kg
 (b) $8\frac{1}{3}$ kg (d) 125 kg (f) 50 kg
3. (a) 36° (d) 9°
 (b) 72 (e) 18
 (c) 72° (f) 45°
4. (a) 30° (e) 10°
 (b) 180 (f) 45°
 (c) 330° (g) 18
 (d) 210° (h) 22.5
7. (a) (i) 76 km
 (ii) 41 km
 (b) 82 km; 492 km/h
8. (a) 130° (e) 335
 (b) 60° (f) $a^\circ = 155^\circ$
 (c) 80° $b^\circ = 25^\circ$
 (d) 65° $c^\circ = 155^\circ$
9. (a) $\{5^\circ, 175^\circ\}, \{50^\circ, 130^\circ\}, \{70^\circ, 110^\circ\},$
 $\{140^\circ, 40^\circ\}, \{95^\circ, 85^\circ\}$
 (b) $\{5^\circ, 85^\circ\}, \{50^\circ, 40^\circ\}$

Exercise 13.6, Page 224

1. (a) 108°
 (b) 120°
 (c) 135°
 (d) 150°
 (e) 162°
2. $60^\circ; 360^\circ$
3. $45^\circ; 360^\circ$
 $36^\circ; 360^\circ$
4. $40^\circ, 40^\circ, 120^\circ, 120^\circ, 200^\circ, 200^\circ$
5. 15
6. 16 will not divide evenly into 360° .

Exercise 14.1, Page 228

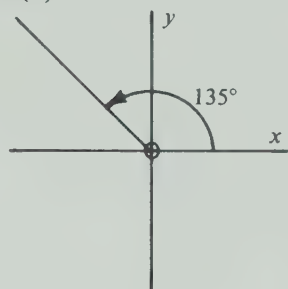
1. (a) 240° (d) 288°
 (b) 48° (e) 144°
 (c) 12° (f) tell the truth

Exercise 14.2, Page 231

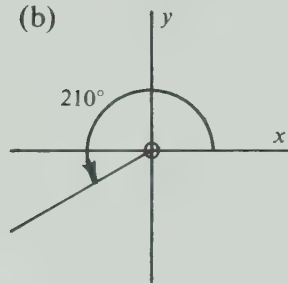
1. (a) 30' (f) 7.92'
 (b) 19.2' (g) 55.26'
 (c) 74.4' (h) 94.02'
 (d) 15.36' (i) 614.46'
 (e) 228.72' (j) 1309.02'
2. (a) 15" (e) 31.2"
 (b) 19.8" (f) 82.2"
 (c) 147" (g) 144.6"
 (d) 48" (h) 609"
3. (a) $25^\circ 24' 36''$ (f) $322^\circ 25' 44.4''$
 (b) $47^\circ 16' 48''$ (g) $194^\circ 48' 54''$
 (c) $121^\circ 27' 36''$ (h) $243^\circ 37' 25.8''$
 (d) $38^\circ 12' 50.4''$ (i) $148^\circ 47' 16.8''$
 (e) $94^\circ 33' 39.6''$ (j) $129^\circ 59' 20.4''$

Exercise 14.3, Page 233

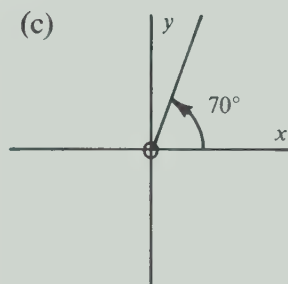
1. (a)



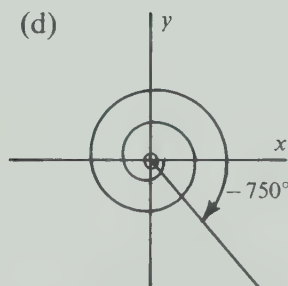
(b)



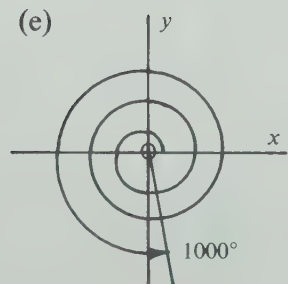
(c)



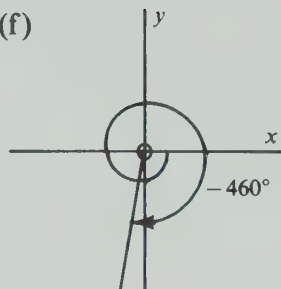
(d)



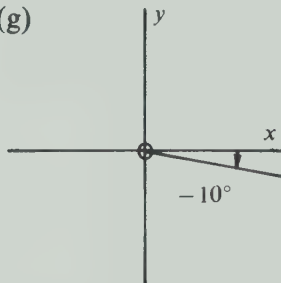
(e)



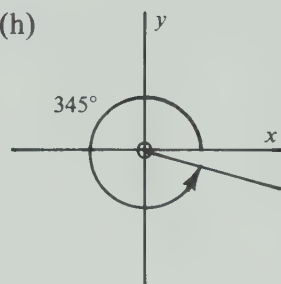
(f)



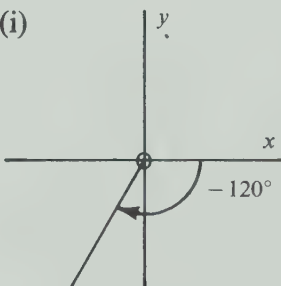
(g)



(h)



(i)



2. (a) 495° (d) 330° (g) 350°
 (b) 570° (e) 280° (h) 705°
 (c) 430° (f) 260° (i) 240°

3. 390° , -330° , 750° , -690° , 1110°

4. (a) 135° (d) 330° (g) 480°
 (b) 150° (e) 45° (h) -390°
 (c) -330° (f) -135° (i) 420°
5. 260° , 620° , -460°
6. (a) -320° (c) -400° (e) -60°
 (b) -240° (d) -460° (f) -360°
7. (a) 140° (c) 127.5° (e) 145°
 (b) 105° (d) 142.5° (f) 152.5°

Exercise 14.4, Page 238

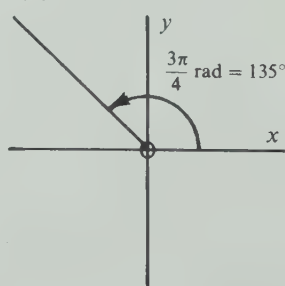
1. $\frac{11}{14}$ rad

2. 17.5 cm

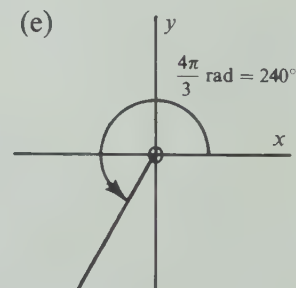
3. $57^\circ 17' 45''$

4. (a) π rad (f) 2π rad (k) $\frac{\pi}{2}$ rad
 (b) $\frac{\pi}{4}$ rad (g) $\frac{7\pi}{6}$ rad (l) $\frac{5\pi}{3}$ rad
 (c) $\frac{\pi}{6}$ rad (h) $\frac{5\pi}{4}$ rad (m) 4π rad
 (d) $\frac{7\pi}{12}$ rad (i) $\frac{4\pi}{3}$ rad (n) 3π rad
 (e) $\frac{\pi}{10}$ rad (j) $\frac{3\pi}{2}$ rad (o) 0 rad
5. (a) $-\pi$ rad (d) $-\frac{3\pi}{2}$ rad (g) $-\frac{3\pi}{4}$ rad
 (b) $\frac{\pi}{2}$ rad (e) $-\frac{11\pi}{6}$ rad (h) $\frac{5\pi}{3}$ rad
 (c) $\frac{3\pi}{2}$ rad (f) $-\frac{5\pi}{4}$ rad

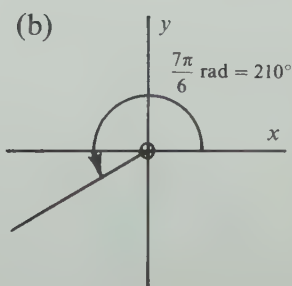
6. (a)



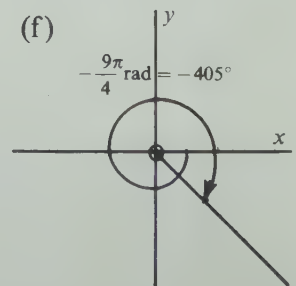
(e)

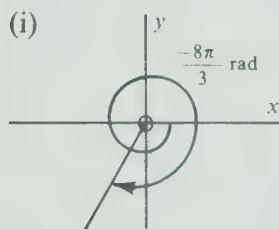
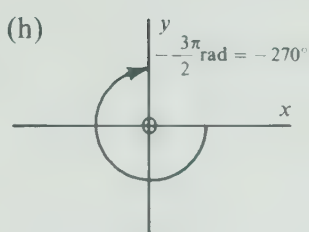
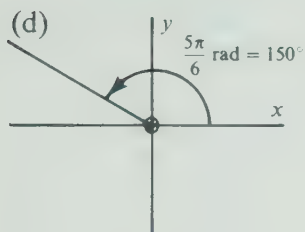
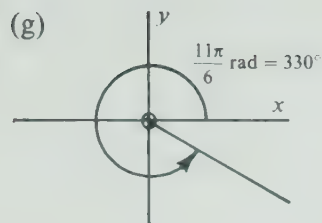
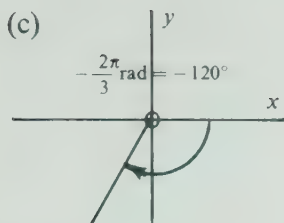


(b)



(f)





7. (a) 45° (e) 135° (i) -360°
 (b) 60° (f) 150° (j) -390°
 (c) 30° (g) 120° (k) 720°
 (d) 90° (h) 300° (l) -810°

8. (a) 3π rad (d) $\frac{4\pi}{3}$ rad (g) $-\frac{4\pi}{3}$ rad
 (b) $\frac{13\pi}{6}$ rad (e) $\frac{11\pi}{4}$ rad (h) $\frac{13\pi}{4}$ rad
 (c) $\frac{3\pi}{2}$ rad (f) $\frac{2\pi}{3}$ rad (i) $\frac{\pi}{2}$ rad

9. $-\frac{7\pi}{4}$ rad, $\frac{9\pi}{4}$ rad, $\frac{17\pi}{4}$ rad

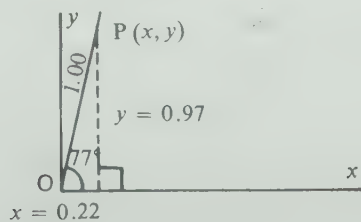
10. (a) $-\frac{11\pi}{6}$ rad (b) $\frac{13\pi}{6}$ rad

11. 0.2 rad 13. 970 cm

12. 3 rad 14. 132 cm

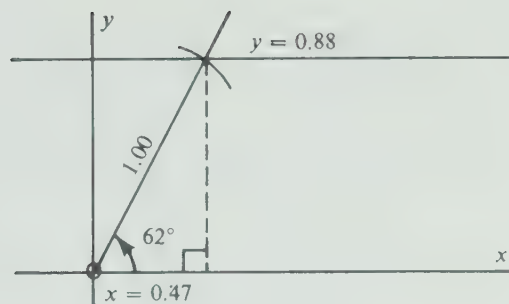
Exercise 15.1, Page 245

3.



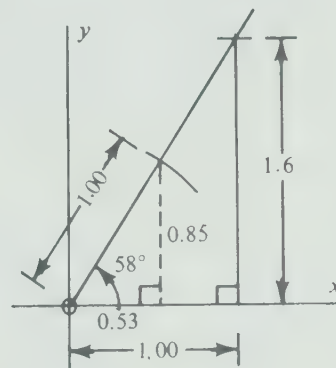
$$\sin 77^\circ = 0.97, \cos 77^\circ = 0.22$$

4.



$$62^\circ, \cos 62^\circ = 0.47$$

5.

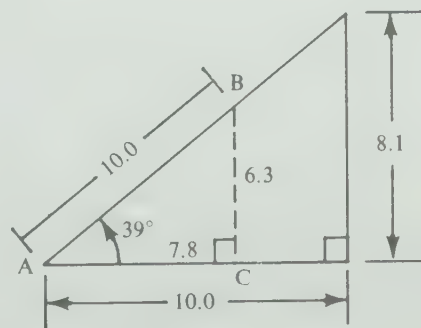


$$A = 58^\circ, \sin A = 0.85, \cos A = 0.53$$

6. (a) $\sin \theta = 0.6$ (c) $\sin \theta = 0.6$
 $\cos \theta = 0.8$ $\cos \theta = 0.8$
 $\tan \theta = 0.75$ $\tan \theta = 0.75$
 (b) $\sin \theta = 0.6$ (d) $\sin \theta = 0.6$
 $\cos \theta = 0.8$ $\cos \theta = 0.8$
 $\tan \theta = 0.75$ $\tan \theta = 0.75$

7. Trig values are independent of the length of the terminal arm OP.

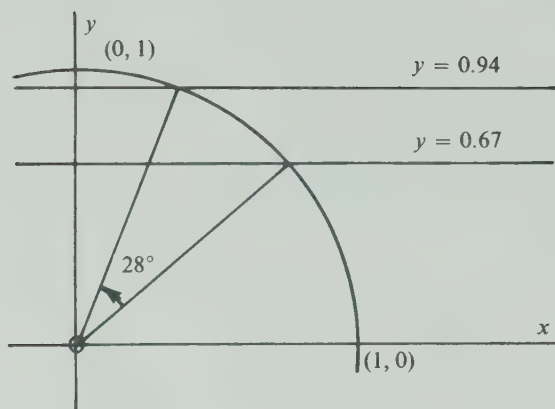
8.



$$AC = 7.8, \angle A = 39^\circ$$

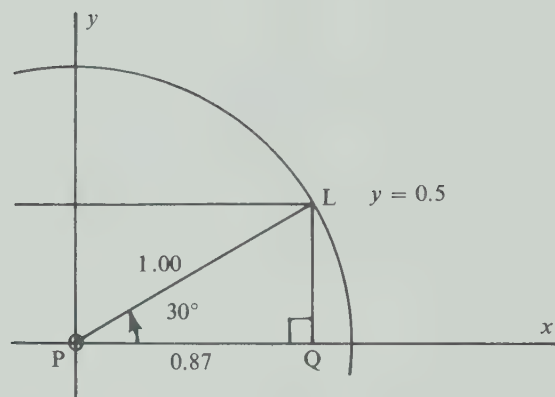
$$\sin A = 0.63, \cos A = 0.78$$

9.



28°

10.



$PQ = 0.87$, $\angle P = 30^\circ$
 $\cos P = 0.87$, $\tan P = 0.58$

11.

	<i>Sine</i>	<i>Cosine</i>	<i>Tangent</i>
(a)	$\frac{3}{\sqrt{73}}$	$\frac{8}{\sqrt{73}}$	$\frac{3}{8}$
(b)	$\frac{2\sqrt{2}}{3}$	$\frac{1}{3}$	$2\sqrt{2}$
(c)	$\frac{11}{5\sqrt{5}}$	$\frac{2}{5\sqrt{5}}$	$\frac{11}{2}$
(d)	$\frac{12}{13}$	$\frac{5}{13}$	$\frac{12}{5}$
(e)	$\frac{1}{10}$	$\frac{3\sqrt{11}}{10}$	$\frac{1}{3\sqrt{11}}$
(f)	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1

Exercise 15.2, Page 248

- $\frac{1}{4}$
 - 1
 - $\frac{\sqrt{6}}{8}$
 - $\frac{\sqrt{6}}{8}$
 - 1
 - $\sqrt{2} + 1$
 - 1
 - $\frac{\sqrt{6}}{8}$
 - $\frac{\sqrt{6}}{8}$
 - 1
- $\frac{6 + 11\sqrt{3}}{6}$
 - $\frac{3}{16}$
 - $\frac{25 + 8\sqrt{3}}{12}$
 - $\frac{2\sqrt{3} - 3}{4}$
 - 1
 - $\frac{3}{2}$
 - $\frac{1}{4}$

Exercise 15.3, Page 250

- 0.9205
 - 0.9272
 - 0.4040
 - 0.9998
 - 0.9994
 - 0.5736
 - 0.5000
 - 0.5000
 - 1.0000
 - 62°
 - 36°
 - 79°
 - 24°
- 0.2924
 - 0.4384
 - 0.9563
 - 0.8988
 - 0.7660
 - 0.0872
 - 0.1392
 - 9.5144
 - 0.0699
 - 30°
 - 66°
 - 4°
 - 4°

Exercise 15.4, Page 253

- $\angle B = 68^\circ$, $\angle C = 22^\circ$, $AC = 93$
- $\angle C = 50^\circ$, $\angle B = 40^\circ$, $AB = 13$
- $\angle A = 27^\circ$, $AC = 44$, $AB = 39$
- $\angle A = 53^\circ$, $BC = 80$, $AB = 60$
- $AB = 353$, $\angle A = 40^\circ$, $\angle B = 50^\circ$
- $\angle C = 54^\circ$, $AC = 73$, $BC = 124$

Exercise 15.5, Page 256

- 173 m
- 162 m
- 10
- 37
- 16
- 15.7 m

11. 3995 m

12. 34

13. (a) 673 mm

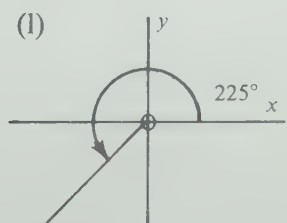
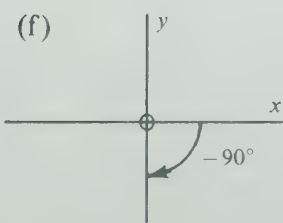
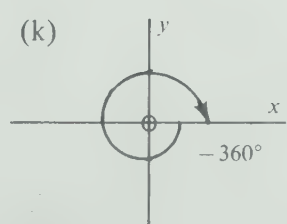
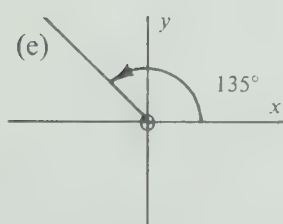
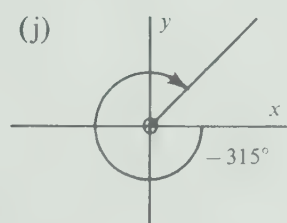
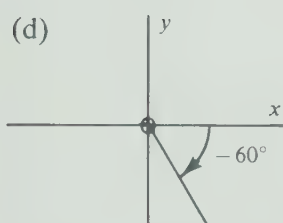
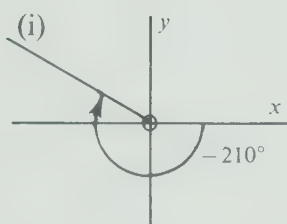
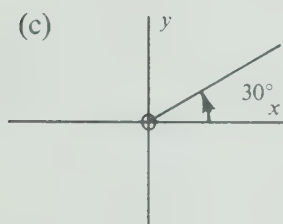
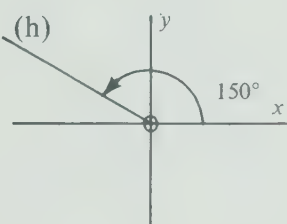
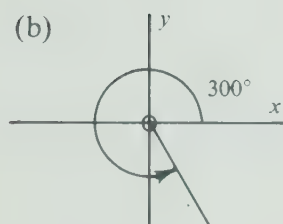
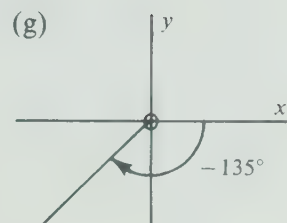
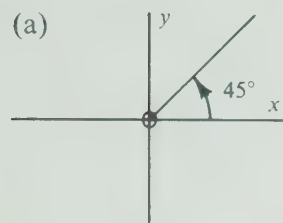
(b) 21°

(c) 1.93 cm

(d) 37

Exercise 16.1, Page 264

2.



3. (a) (c) (d) (f)

4. (a) 300° , -420°

(b) 240° , -480°

(c) 497° , -223°

(d) 39° , -681°

(e) 367° , -353°

(f) 10° , -350°

(g) 290° , -70°

(h) 120° , 240°

5. (a) 1st

(b) 3rd

(c) 4th

(d) 2nd

(e) 3rd

(f) 4th

(g) 3rd

(h) 1st

6. (a) 2nd

(b) 3rd

(c) 4th

(d) 3rd

(e) 1st

(f) 4th

(g) 2nd

(h) 4th

Exercise 16.2, Page 268

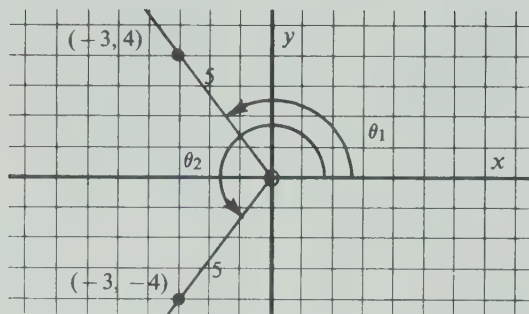
2.

	$\sin \theta$	$\cos \theta$	$\tan \theta$
(a)	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{4}{3}$
(b)	$\frac{1}{\sqrt{2}}$	$-\frac{1}{\sqrt{2}}$	-1
(c)	$-\frac{4}{5}$	$-\frac{3}{5}$	$\frac{4}{3}$
(d)	$-\frac{1}{\sqrt{2}}$	$-\frac{1}{\sqrt{2}}$	1
(e)	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$-\sqrt{3}$
(f)	$-\frac{12}{13}$	$\frac{5}{13}$	$-\frac{12}{5}$
(g)	$\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{\sqrt{3}}$
(h)	$-\frac{7}{\sqrt{53}}$	$-\frac{2}{\sqrt{53}}$	$\frac{7}{2}$
(i)	$-\frac{5}{13}$	$-\frac{12}{13}$	$\frac{5}{12}$
(j)	$\frac{15}{17}$	$\frac{8}{17}$	$\frac{15}{8}$

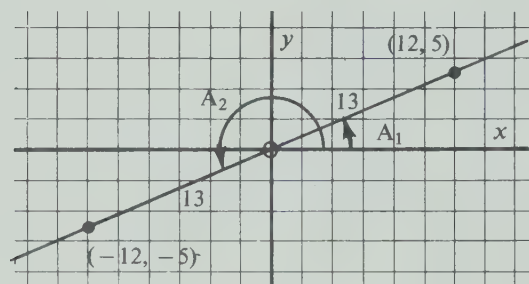
3. $(-1, -1)$, $\cos \theta = -\frac{1}{\sqrt{2}}$, $\sin \theta = -\frac{1}{\sqrt{2}}$

4. (a) $-\frac{12}{13}$ (d) 1
 (b) $-\frac{5}{12}$ (e) $-\frac{5}{12}$
 (c) $-\frac{60}{169}$

5. $\sin \theta_1 = \frac{4}{5}, \tan \theta_1 = -\frac{4}{3}$
 $\sin \theta_2 = -\frac{4}{5}, \tan \theta_2 = \frac{4}{3}$



6. $\sin A_1 = \frac{5}{13}, \cos A_1 = \frac{12}{13}$
 $\sin A_2 = -\frac{5}{13}, \cos A_2 = -\frac{12}{13}$



7. $\sin \theta = -\frac{\sqrt{91}}{10}, \tan \theta = \frac{\sqrt{91}}{3}$

8. $\sin A = \frac{12}{13}, \cos A = -\frac{5}{13}, \tan A = -\frac{12}{5}$

Exercise 16.3, Page 270

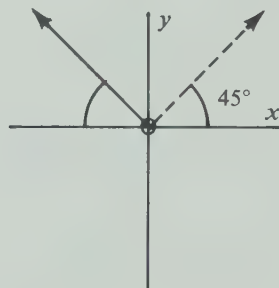
- 3rd
- 4th
- $\cos B > 0, \tan B < 0$
- 2nd

	$\sin \theta$	$\cos \theta$	$\tan \theta$
(a)	$-\frac{4}{5}$	$\pm \frac{3}{5}$	$\mp \frac{4}{3}$
(b)	$\pm \frac{3}{5}$	$\frac{4}{5}$	$\pm \frac{3}{4}$

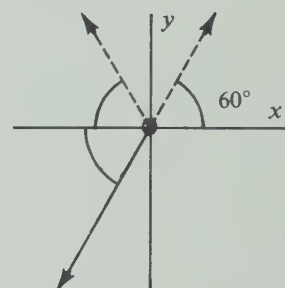
(c)	$\pm \frac{1}{\sqrt{10}}$	$\pm \frac{3}{\sqrt{10}}$	$\frac{1}{3}$
(d)	$\pm \frac{1}{\sqrt{2}}$	$-\frac{1}{\sqrt{2}}$	∓ 1
(e)	$\frac{\sqrt{3}}{2}$	$\pm \frac{1}{2}$	$\pm \sqrt{3}$
(f)	$\pm \frac{1}{\sqrt{2}}$	$\mp \frac{1}{\sqrt{2}}$	-1
(g)	$\pm \frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$\mp \frac{1}{\sqrt{3}}$
(h)	$\pm \frac{\sqrt{3}}{2}$	$\mp \frac{1}{2}$	$-\sqrt{3}$
(i)	$-\frac{3}{5}$	$\pm \frac{4}{5}$	$\mp \frac{3}{4}$
(j)	$\pm \frac{4}{5}$	$-\frac{3}{5}$	$\mp \frac{4}{3}$

Exercise 16.4, Page 278

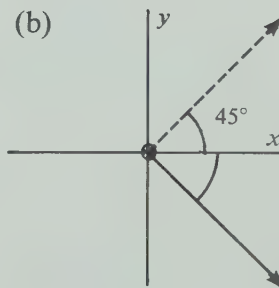
2. (a)



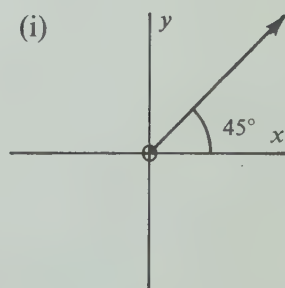
(h)



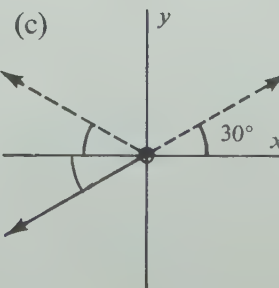
(b)



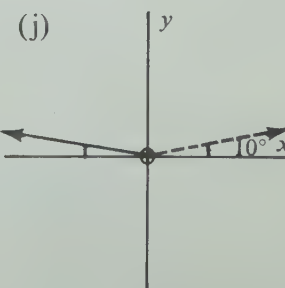
(i)

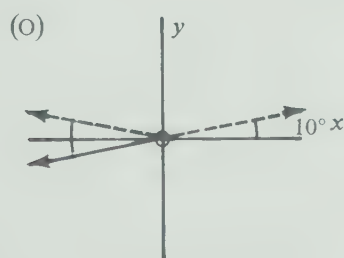
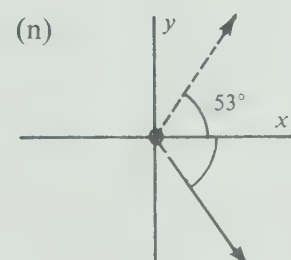
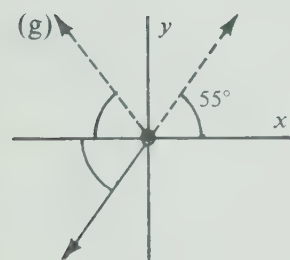
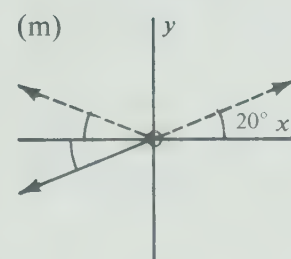
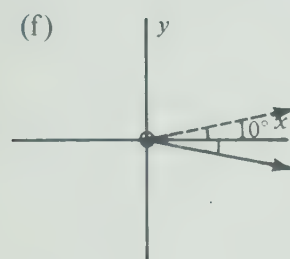
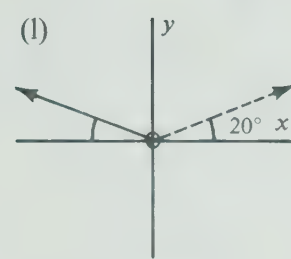
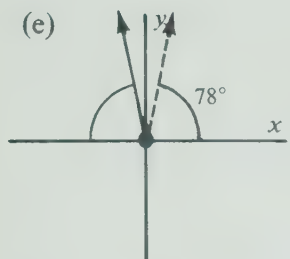
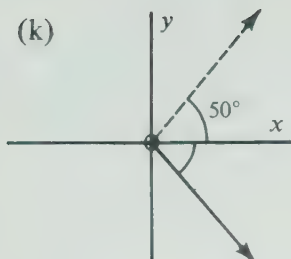
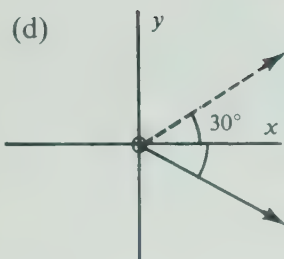


(c)



(j)





5. (a) $-\tan 84^\circ$ (e) $-\tan 78^\circ$
 (b) $-\tan 63^\circ$ (f) $-\tan 60^\circ$
 (c) $\tan 25^\circ$ (g) $-\tan 55^\circ$
 (d) $\tan 80^\circ$ (h) $-\tan 8^\circ$

Exercise 16.5, Page 282

1. (a) 0.4540 (h) -0.6018
 (b) 0.7660 (i) -0.0699
 (c) 0.7536 (j) -0.5000
 (d) -1.9626 (k) -0.9397
 (e) -0.5736 (l) 11.4301
 (f) -0.8660 (m) -0.1736
 (g) -0.5000 (n) -0.1736
2. (a) $38^\circ, 142^\circ$ (e) $225^\circ, 315^\circ$
 (b) $198^\circ, 342^\circ$ (f) $262^\circ, 278^\circ$
 (c) $68^\circ, 112^\circ$ (g) $11^\circ, 169^\circ$
 (d) $5^\circ, 175^\circ$ (h) $50^\circ, 130^\circ$
3. (a) $50^\circ, 310^\circ$ (e) $5^\circ, 355^\circ$
 (b) $110^\circ, 250^\circ$ (f) $89^\circ, 271^\circ$
 (c) $92^\circ, 268^\circ$ (g) $149^\circ, 211^\circ$
 (d) $20^\circ, 340^\circ$ (h) $134^\circ, 226^\circ$
4. (a) $22^\circ, 202^\circ$ (e) $164^\circ, 344^\circ$
 (b) $39^\circ, 219^\circ$ (f) $50^\circ, 230^\circ$
 (c) $85^\circ, 265^\circ$ (g) $116^\circ, 296^\circ$
 (d) $97^\circ, 277^\circ$ (h) $8^\circ, 188^\circ$

Exercise 17.1, Page 287

5.	x	y	$\sin \theta$	$\cos \theta$
1st quadrant	+	+	+ inc.	+ dec.
2nd quadrant	-	+	+ dec.	- dec.
3rd quadrant	-	-	- dec.	- inc.
4th quadrant	+	-	- inc.	+ inc.

6. (a) 3 (c) -3
 (b) 1 (d) 2

3. (a) $\sin 70^\circ$ (e) $-\sin 80^\circ$
 (b) $\sin 5^\circ$ (f) $-\sin 80^\circ$
 (c) $-\sin 17^\circ$ (g) $-\sin 60^\circ$
 (d) $-\sin 50^\circ$ (h) $-\sin 10^\circ$
4. (a) $-\cos 68^\circ$ (e) $-\cos 85^\circ$
 (b) $-\cos 10^\circ$ (f) $\cos 75^\circ$
 (c) $-\cos 20^\circ$ (g) $\cos 58^\circ$
 (d) $-\cos 70^\circ$ (h) $\cos 14^\circ$

7.		Maximum	Minimum
(a)	$\sin \theta$	1	-1
(b)	$\cos \theta$	1	-1
(c)	$\tan \theta$	undefined	undefined
(d)	$\sin^2 \theta$	1	0
(e)	$\cos 4\theta$	1	-1
(f)	$\tan \frac{3\theta}{2}$	undefined	undefined

Exercise 17.3, Page 293

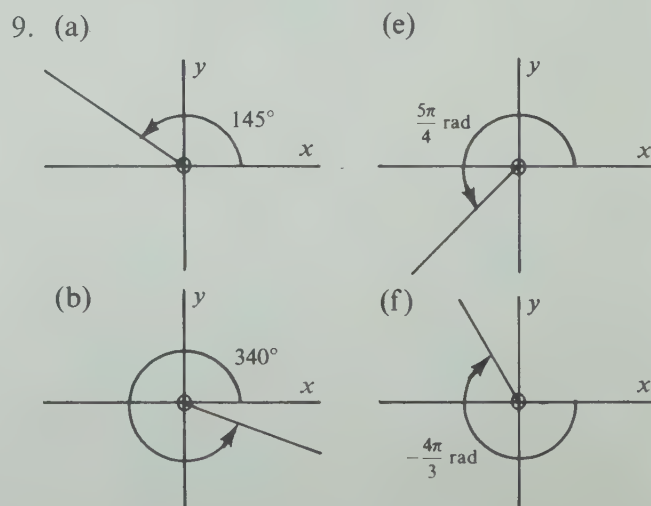
- (a) $\angle C = 10^\circ$, $b = 56$ m, $c = 14$ m
 - (b) $\angle C = 78^\circ$, $a = 7.8$ cm, $b = 5.0$ cm
 - (c) $\angle A = 115^\circ$, $b = 17$ cm, $c = 11$ cm
 - (d) $\angle B = 41^\circ$ or 139° , $\angle C = 114^\circ$ or 16°
 $c = 173$ cm (170 cm, correct to two digits)
or 53 cm
 - (e) $a = 59$, $b = 40$, $\angle C = 105^\circ$
 - (f) $\angle B = 64^\circ$, $\angle C = 43^\circ$, $b = 13$
 - (g) $a = 32$ or 6.8 , $\angle A = 92^\circ$ or 12° ,
 $\angle B = 50^\circ$ or 130°
 - (h) $a = 12$, $c = 7.2$, $\angle B = 100^\circ$
 - (i) $\angle B = 29^\circ$, $\angle C = 28^\circ$, $c = 2.4$
 - (j) $\angle C = 34^\circ$, $a = 2.3$, $c = 1.3$
2. 1.6 km from A and 1.3 km from B
 3. 950 m from A and 1340 m from B
 4. Distance at first sighting is 1804 m.
Distance at second sighting is 1682 m.
 5. 268 m
 6. 956 km
 7. $x \doteq 6.71$
 8. 74 m

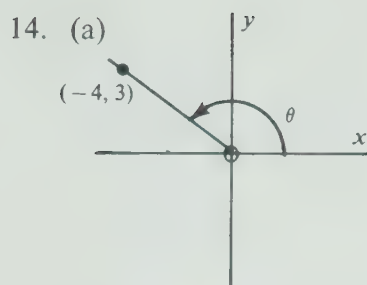
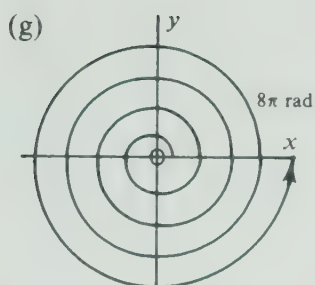
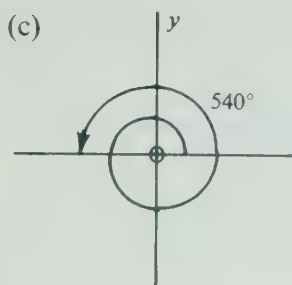
Exercise 17.4, Page 298

1. (a) $c = 37$, $\angle A = 64^\circ$, $\angle B = 44^\circ$
(b) $a = 3.6$, $\angle B = 98^\circ$, $\angle C = 39^\circ$
(c) $b = 66$, $\angle A = 36^\circ$, $\angle C = 32^\circ$
(d) $a = 45$, $\angle B = 54^\circ$, $\angle C = 21^\circ$
(e) $\angle A = 93^\circ$, $\angle B = 48^\circ$, $\angle C = 39^\circ$
(f) $\angle A = 56^\circ$, $\angle B = 47^\circ$, $\angle C = 77^\circ$
(g) $\angle A = 76^\circ$, $\angle B = 48^\circ$, $\angle C = 56^\circ$
(h) $a = 148$, $\angle B = 56^\circ$, $\angle C = 41^\circ$
(i) $b = 70$, $\angle A = 76^\circ$, $\angle C = 56^\circ$
(j) $\angle A = 54^\circ$, $\angle B = 46^\circ$, $\angle C = 80^\circ$
2. 8°
3. 192 m, 9°
4. 41° , 56
5. 185 km
6. 21 km
7. Distance through Cutshoe Mountains to camp is 9.5 km.
Distance through Dismal Swamp to camp is 8.2 km.

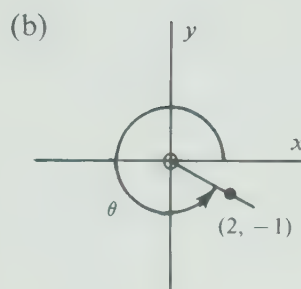
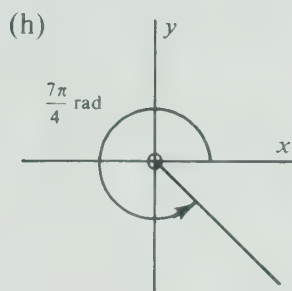
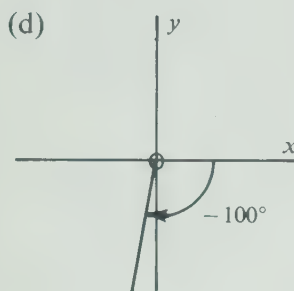
MBS Exercise 4, Page 299

1. (a) $a^\circ = 25^\circ$, $b^\circ = 115^\circ$, $c^\circ = 65^\circ$
 (b) $x^\circ = 62\frac{1}{2}^\circ$, $y^\circ = 55^\circ$
 (c) $r^\circ = 160^\circ$, $s^\circ = 10^\circ$, $t^\circ = 10^\circ$, $w^\circ = 10^\circ$
 (d) $a^\circ = 30^\circ$, $b^\circ = 30^\circ$, $c^\circ = 60^\circ$, $d^\circ = 240^\circ$
 (e) $a^\circ = 68^\circ$, $b^\circ = 44^\circ$, $c^\circ = 68^\circ$, $d^\circ = 68^\circ$,
 $e^\circ = 112^\circ$
 (f) $r^\circ = 22^\circ$, $p^\circ = 60^\circ$, $q^\circ = 60^\circ$, $s^\circ = 22^\circ$,
 $t^\circ = 38^\circ$, $u^\circ = 52^\circ$
2. (a) $x^\circ = 40^\circ$, $y^\circ = 80^\circ$
 (b) $s^\circ = 40^\circ$, $t^\circ = 35^\circ$
 (c) $x^\circ = 25^\circ$, $y^\circ = 25^\circ$, $z^\circ = 65^\circ$
 (d) $a^\circ = 124^\circ$, $b^\circ = 28^\circ$, $c^\circ = 56^\circ$, $d^\circ = 62^\circ$,
 $e^\circ = 62^\circ$
 (e) $a^\circ = 23^\circ$, $b^\circ = 23^\circ$, $c^\circ = 23^\circ$, $d^\circ = 46^\circ$
 (f) $e^\circ = 60^\circ$, $f^\circ = 60^\circ$, $g^\circ = 60^\circ$, $h^\circ = 30^\circ$,
 $j^\circ = 120^\circ$
5. (a) $a^\circ = 155^\circ$ (d) $d^\circ = 500^\circ$
 (b) $b^\circ = -145^\circ$ (e) $e^\circ = -540^\circ$
 (c) $c^\circ = 230^\circ$ (f) $f^\circ = 270^\circ$
6. (a) $s = \frac{\pi}{2}$ rad (d) $w = \frac{5\pi}{6}$ rad
 (b) $t = \frac{3\pi}{2}$ rad (e) $x = \frac{4\pi}{3}$ rad
 (c) $u = -\frac{7\pi}{2}$ rad (f) $y = \frac{7\pi}{4}$ rad
7. (a) 60° (c) 120° (e) 165° (g) -450°
 (b) 45° (d) -150° (f) 540° (h) 225°
8. (a) $\frac{2\pi}{3}$ rad (c) $\frac{7\pi}{4}$ rad (e) $-\frac{3\pi}{4}$ rad (g) 4π rad
 (b) $-\frac{\pi}{6}$ rad (d) $\frac{4\pi}{3}$ rad (f) $-\frac{13\pi}{6}$ rad (h) $\frac{5\pi}{6}$ rad

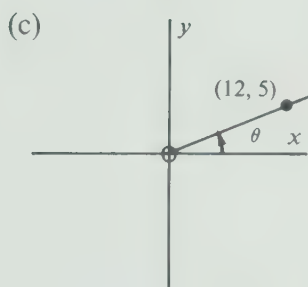




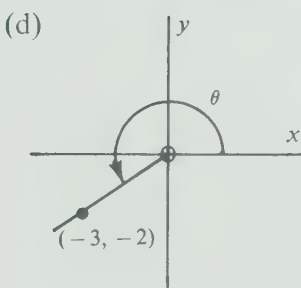
$$\begin{aligned}\sin \theta &= \frac{3}{5} \\ \cos \theta &= -\frac{4}{5} \\ \tan \theta &= -\frac{3}{4}\end{aligned}$$



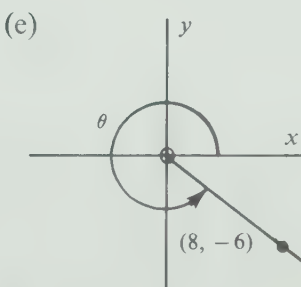
$$\begin{aligned}\sin \theta &= -\frac{1}{\sqrt{5}} \\ \cos \theta &= \frac{2}{\sqrt{5}} \\ \tan \theta &= -\frac{1}{2}\end{aligned}$$



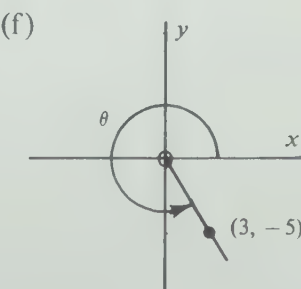
$$\begin{aligned}\sin \theta &= \frac{5}{13} \\ \cos \theta &= \frac{12}{13} \\ \tan \theta &= \frac{5}{12}\end{aligned}$$



$$\begin{aligned}\sin \theta &= -\frac{2}{\sqrt{13}} \\ \cos \theta &= -\frac{3}{\sqrt{13}} \\ \tan \theta &= \frac{2}{3}\end{aligned}$$



$$\begin{aligned}\sin \theta &= -\frac{3}{5} \\ \cos \theta &= \frac{4}{5} \\ \tan \theta &= -\frac{3}{4}\end{aligned}$$



$$\begin{aligned}\sin \theta &= -\frac{5}{\sqrt{34}} \\ \cos \theta &= \frac{3}{\sqrt{34}} \\ \tan \theta &= -\frac{5}{3}\end{aligned}$$

10. (a) $16^\circ 15'$
(b) $247^\circ 60'$

(c) 27.75°
(d) $48^\circ 56'$

11. (a) $37^\circ 28' 12''$
(b) $186^\circ 21' 36''$

(c) $19^\circ 19' 15.6''$
(d) $95^\circ 51' 14.4''$

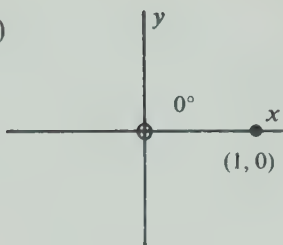
12. (a) 35.3°
(b) 152.83°

(c) 18.54°
(d) 39.30°

13.

	$\sin \theta$	$\cos \theta$	$\tan \theta$
(a)	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{4}{3}$
(b)	$-\frac{3}{5}$	$-\frac{4}{5}$	$\frac{3}{4}$
(c)	$\frac{12}{13}$	$-\frac{5}{13}$	$-\frac{12}{5}$
(d)	$-\frac{1}{\sqrt{10}}$	$\frac{3}{\sqrt{10}}$	$-\frac{1}{3}$
(e)	$-\frac{1}{\sqrt{5}}$	$-\frac{2}{\sqrt{5}}$	$\frac{1}{2}$
(f)	$\frac{2}{\sqrt{29}}$	$-\frac{5}{\sqrt{29}}$	$-\frac{2}{5}$

15. (a)

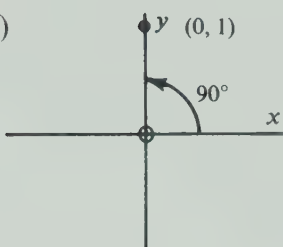


$$\sin 0^\circ = 0$$

$$\cos 0^\circ = 1$$

$$\tan 0^\circ = 0$$

(b)

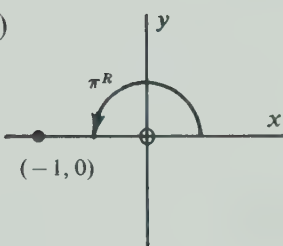


$$\sin 90^\circ = 1$$

$$\cos 90^\circ = 0$$

$$\tan 90^\circ \text{ is undefined}$$

(c)

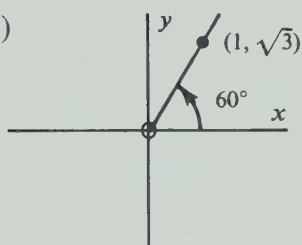


$$\sin \pi = 0$$

$$\cos \pi = -1$$

$$\tan \pi = 0$$

(d)

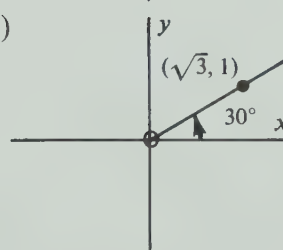


$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 60^\circ = \sqrt{3}$$

(e)

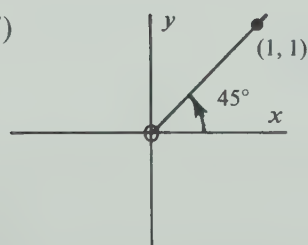


$$\sin 30^\circ = \frac{1}{2}$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

(f)

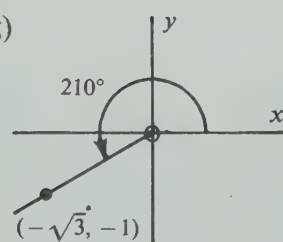


$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 45^\circ = 1$$

(g)

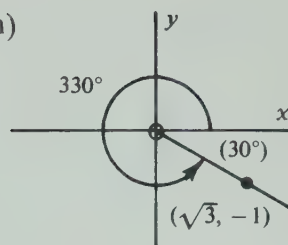


$$\sin 210^\circ = -\frac{1}{2}$$

$$\cos 210^\circ = -\frac{\sqrt{3}}{2}$$

$$\tan 210^\circ = \frac{1}{\sqrt{3}}$$

(h)

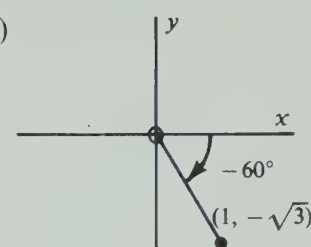


$$\sin 330^\circ = -\frac{1}{2}$$

$$\cos 330^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 330^\circ = -\frac{1}{\sqrt{3}}$$

(i)

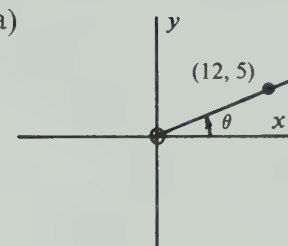


$$\sin (-60^\circ) = -\frac{\sqrt{3}}{2}$$

$$\cos (-60^\circ) = \frac{1}{2}$$

$$\tan (-60^\circ) = -\sqrt{3}$$

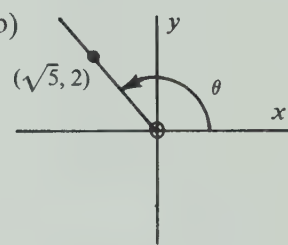
16. (a)



$$\cos \theta = \frac{12}{13}$$

$$\tan \theta = \frac{5}{12}$$

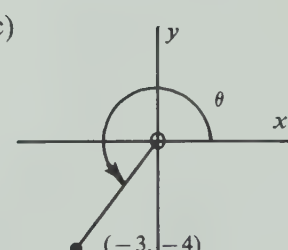
(b)



$$\cos \theta = \frac{\sqrt{5}}{3}$$

$$\tan \theta = \frac{2}{\sqrt{5}}$$

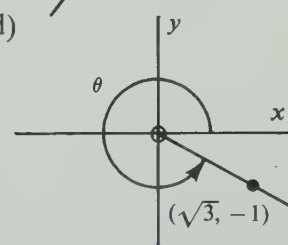
(c)



$$\sin \theta = -\frac{4}{5}$$

$$\tan \theta = \frac{4}{3}$$

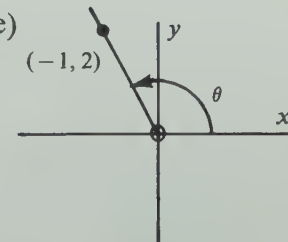
(d)



$$\sin \theta = -\frac{1}{2}$$

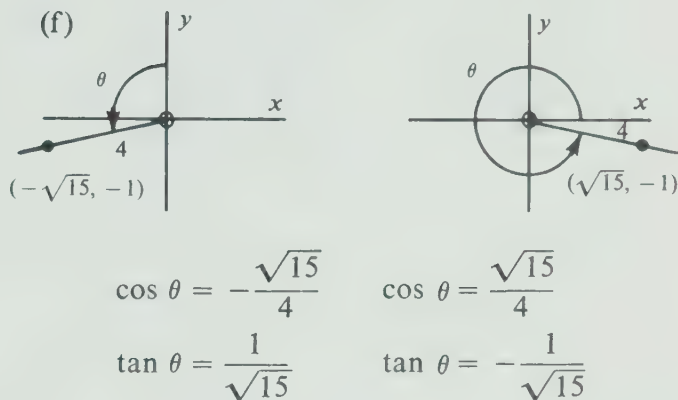
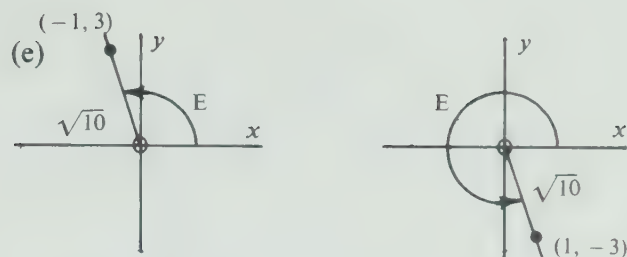
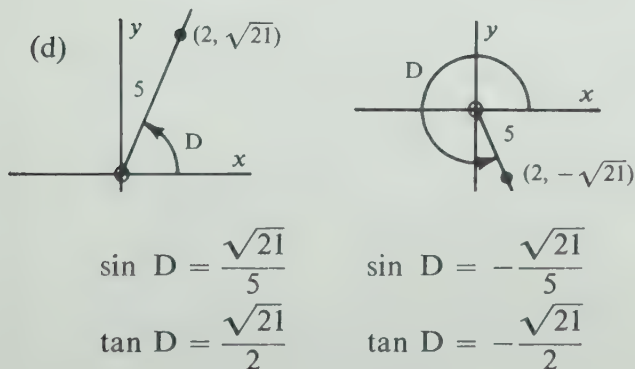
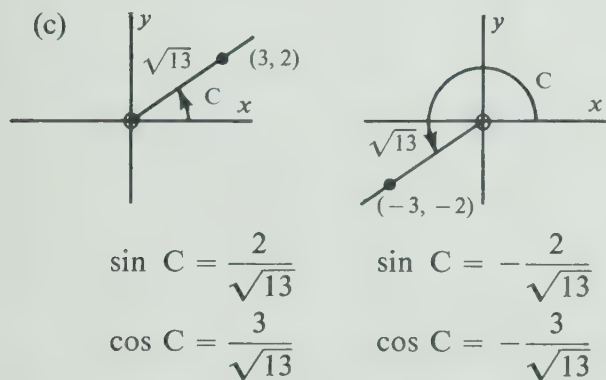
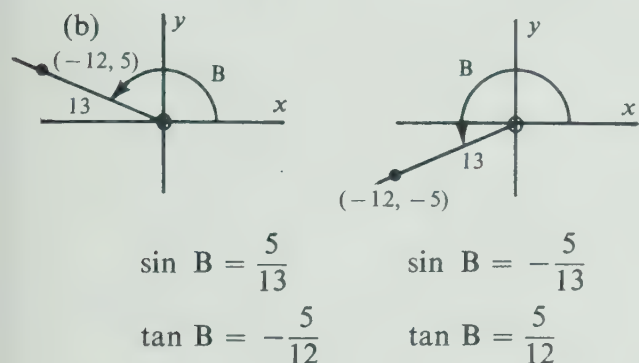
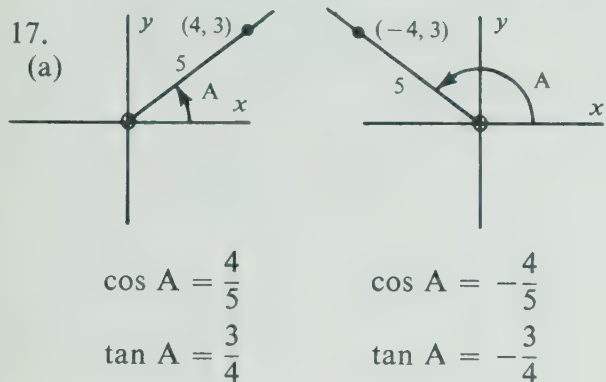
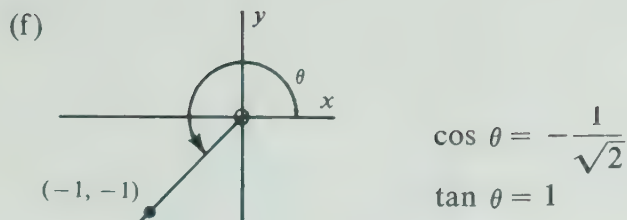
$$\tan \theta = -\frac{1}{\sqrt{3}}$$

(e)



$$\sin \theta = \frac{2}{\sqrt{5}}$$

$$\cos \theta = -\frac{1}{\sqrt{5}}$$



18. (a) $40^\circ, 140^\circ$ (d) $199^\circ, 341^\circ$
 (b) $70^\circ, 290^\circ$ (e) $140^\circ, 320^\circ$
 (c) $58^\circ, 238^\circ$ (f) $129^\circ, 231^\circ$
19. (a) $\sin 5^\circ$ (d) $-\sin 14^\circ$ (g) $-\cos 4^\circ$
 (b) $\cos 25^\circ$ (e) $-\tan 64^\circ$ (h) $-\sin 58^\circ$
 (c) $\tan 25^\circ$ (f) $-\cos 10^\circ$ (i) $-\tan 80^\circ$

20.

	$\sin A$	$\cos A$	$\tan A$	$\sin B$	$\cos B$	$\tan B$
(a)	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{4}{3}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{3}{4}$
(b)	$\frac{3}{\sqrt{13}}$	$\frac{2}{\sqrt{13}}$	$\frac{3}{2}$	$\frac{2}{\sqrt{13}}$	$\frac{3}{\sqrt{13}}$	$\frac{2}{3}$
(c)	$\frac{r}{q}$	$\frac{p}{q}$	$\frac{r}{p}$	$\frac{p}{q}$	$\frac{r}{q}$	$\frac{p}{r}$
(d)	$\frac{5}{\sqrt{41}}$	$\frac{4}{\sqrt{41}}$	$\frac{5}{4}$	$\frac{4}{\sqrt{41}}$	$\frac{5}{\sqrt{41}}$	$\frac{4}{5}$

21. (a) $\theta = 63^\circ$ (c) $\theta = 50^\circ$
 (b) $\theta = 40^\circ$ (d) $\theta = 22^\circ$
22. (a) $h = 10.7$ (c) $s = 2.01$
 $k = 11.8$ $t = 7.02$
 (b) $p = 12.7$ (d) $a = 28.8$
 $q = 20.4$ $b = 17.3$

23. (a) $AC = 15.6$, $\angle A = 58^\circ$, $\angle C = 32^\circ$
 (b) $QR = 26.8$, $\angle P = 48^\circ$, $\angle Q = 42^\circ$
 (c) $TW = 5.1$, $WS = 14.1$, $\angle S = 20^\circ$
 (d) $KL = 7.1$, $LJ = 3.2$, $\angle L = 63^\circ$

24. (a) $w = 3$, $h = 3\sqrt{3}$, $\angle W = 30^\circ$
 (b) $p = 10\sqrt{3}$, $q = 20$, $\angle P = 60^\circ$
 (c) $r = 23$, $s = 23\sqrt{2}$, $\angle T = 45^\circ$
 (d) $a = 5\sqrt{3}$, $b = 10$, $\angle C = 30^\circ$

25. (a) $b = 19.6$, $c = 19.2$, $\angle C = 63^\circ$
 (b) $p = 6.0$, $q = 8.4$, $\angle R = 67^\circ$
 (c) $e = 25.2$, $\angle E = 60^\circ$, $\angle F = 46^\circ$
 (d) $h = 1.8$, $k = 2.5$, $\angle K = 40^\circ$

26. (a) $\angle A = 78^\circ$, $\angle B = 61^\circ$, $\angle C = 41^\circ$
 (b) $YZ = 5.4$, $\angle Y = 63^\circ$, $\angle Z = 45^\circ$
 (c) $LN = 8.0$, $\angle L = 30^\circ$, $\angle N = 20^\circ$
 (d) $\angle R = 45^\circ$, $\angle S = 17^\circ$, $\angle T = 118^\circ$

27. (a) $p = 2\sqrt{7}$ (c) $\theta = 60^\circ$
 (b) $q = \frac{16\sqrt{6}}{3}$ (d) $s = 2\sqrt{61}$

28. (a) $a = 16.1$, $b = 15.9$, $\angle B = 53^\circ$
 (b) $b = 3.1$, $\angle A = 86^\circ$, $\angle C = 45^\circ$
 (c) $a = 23.2$, $b = 8.8$, $\angle C = 78^\circ$
 (d) $\angle A = 42^\circ$, $\angle B = 62^\circ$, $\angle C = 75^\circ$
 (e) $\angle A = 36^\circ$, $\angle B = 26^\circ$, $\angle C = 118^\circ$
 (f) $c = 42.6$, $\angle A = 39^\circ$, $\angle C = 86^\circ$

29. 55.6 m

30. 800 m approximately

Review Exercise, Page 309

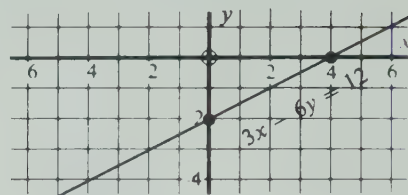
1. (a) $4x - y - 5 = 0$
 (b) $2x - 3y - 17 = 0$
 (c) $y = 8$
 (d) $x = 2$

2. (a) 3
 (b) $3x - y - 1 = 0$
 (c) $2\sqrt{10}$

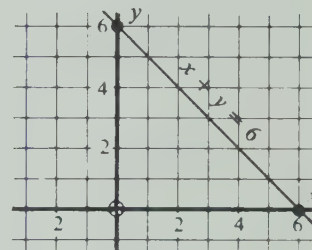
3. (a) $4x - y - 15 = 0$
 (b) (5, 5)
 (c) $2\sqrt{17}$

4. (a) $\frac{1}{2}$
 (b) $2\sqrt{5}$
 (c) (-1, 2)

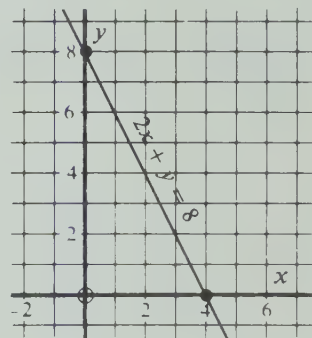
5. (a) $\frac{1}{2}$
 (b) x -intercept = 4
 (c) y -intercept = -2
 (d)



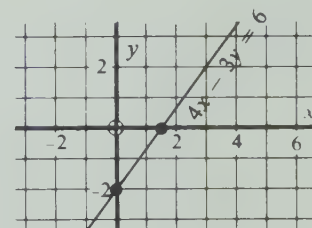
6. (a) slope = -1
 x -intercept = 6
 y -intercept = 6



- (b) slope = -2
 x -intercept = 4
 y -intercept = 8



- (c) slope = $\frac{4}{3}$
 x -intercept = $\frac{3}{2}$
 y -intercept = -2



7. (a) (14, 0), (0, 4)
 (b) $2x + 7y + 1 = 0$
 (c) $3x - y - 42 = 0$
8. (a) x -intercept = 12, y -intercept = -4
 (b) $x + 4y - 12 = 0$
 (c) $3x - 4y - 16 = 0$

9. (a) $-\frac{5}{3}$ (b)
 (b) 5
 (c) $x = 6$

10. (a) $M = \frac{1}{3}T$

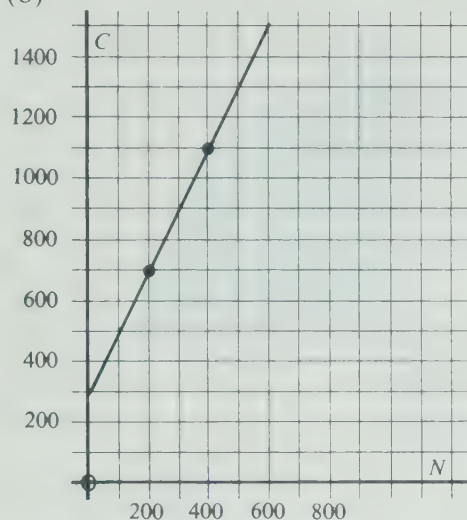


(c) 2 kg

(d) 24 cm

11. (a) $C = 2N + 300$

(b)



(c) 300

(d) \$1100

(e) 200

12. (a) $\frac{\pi}{2}$ rad

(c) 3π rad

(b) $\frac{5\pi}{12}$ rad

(d) $-\frac{3\pi}{4}$ rad

13. (a) 360°

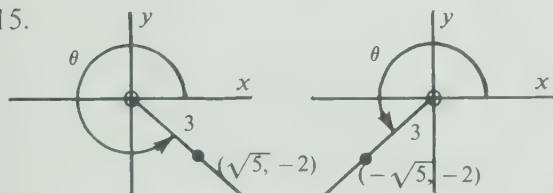
(c) -300°

(b) 210°

(d) 900°

14. $\sin \theta = \frac{4}{5}$, $\cos \theta = -\frac{3}{5}$, $\tan \theta = -\frac{4}{3}$

15.



$$\cos \theta = \frac{\sqrt{5}}{3}$$

$$\cos \theta = -\frac{\sqrt{5}}{3}$$

$$\tan \theta = -\frac{2}{\sqrt{5}}$$

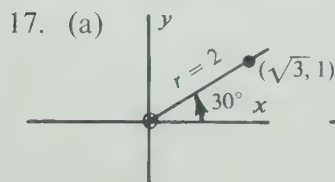
$$\tan \theta = \frac{2}{\sqrt{5}}$$

16. (a) $-\cos 70^\circ$

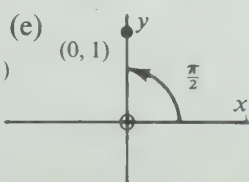
(c) $-\tan 63^\circ$

(b) $-\sin 17^\circ$

(d) $-\cos 35^\circ$

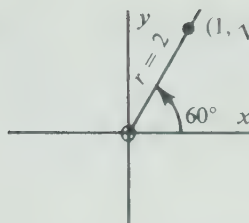


$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

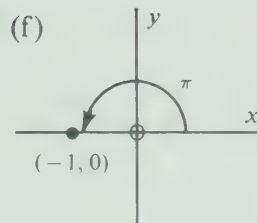


$$\sin \frac{\pi}{2} = 1$$

(b)

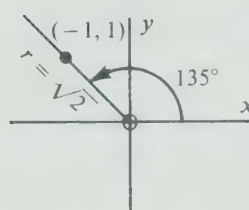


$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$



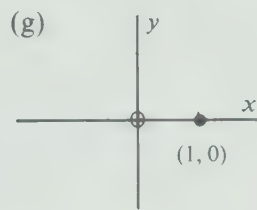
$$\cos \pi = -1$$

(c)



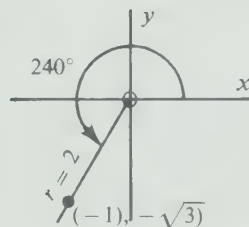
$$\tan 135^\circ = \frac{1}{-1} = -1$$

(g)



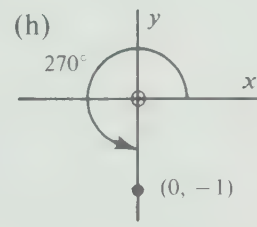
$$\sin 0^\circ = 0$$

(d)



$$\sin 240^\circ = -\frac{\sqrt{3}}{2}$$

(h)



$$\tan 270^\circ \text{ is undefined}$$

18. (a) $\angle B = 80^\circ$, $AB = 1.6$, $BC = 3.1$

(b) $FD = 6.7$, $\angle E = 72^\circ$, $\angle D = 43^\circ$

(c) $\angle H = 37^\circ$, $JG = 8.4$, $GH = 11.2$

(d) $\angle J = 40^\circ$, $KL = 16$, $JK = 14$

(e) $QR = 19$, $\angle Q = 31^\circ$, $\angle R = 25^\circ$

(f) $\angle M = 79^\circ$, $\angle N = 57^\circ$, $\angle O = 44^\circ$

19. (a) $y = 1$

(d) $(4, \frac{7}{2})$

(b) $x = 10$

(e) 23°

(c) 12, 5, 13

20. (a) $y = 7$

(b) $AB = 2\sqrt{13}$, $BC = 8$, $CA = 2\sqrt{13}$
Triangle is isosceles, not equilateral.

(c) $D(-1, 4)$, $E(3, 4)$

(d) DE has equation $y = 4$.

BC has equation $y = 1$.

Slopes equal, each = 0.

(e) Length of DE = 4.

Length of BC = 8, $DE = \frac{1}{2}BC$.

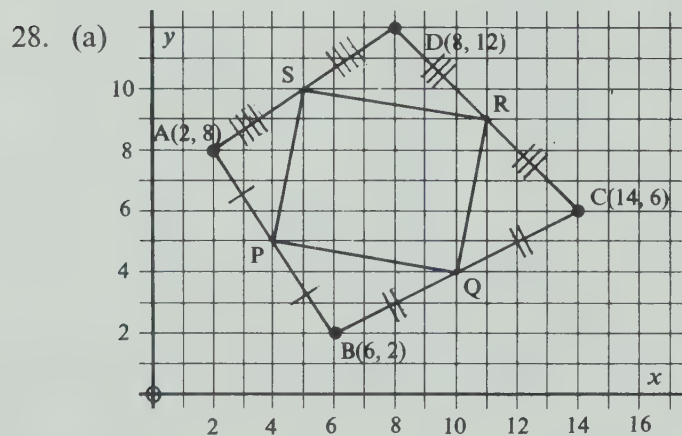
21. (a) $PQ = 5, PR = 10, QR = 5\sqrt{5}$
 (b) $(\frac{1}{2}, 1)$
 (c) $QS = \frac{5\sqrt{5}}{2}, SR = \frac{5\sqrt{5}}{2}, SP = \frac{5\sqrt{5}}{2}$
 $QS = SR = SP.$
 (d) $4x - 3y - 23 = 0.$
22. (a) $PQ = 10, QR = 15, PR = \sqrt{241} \approx 15.52$
 (b) $\angle PQR = 74^\circ$

23. 139 m

24. 8.1 km

25. 53°

26. (a) $x^2 + y^2 = 16$ (d) 52°
 (b) 2.7 (e) 93°
 (c) $70^\circ, 70^\circ$
27. (a) $x^2 + y^2 = 25$
 (b) $y = 3$
 (c) $QP = 3\sqrt{10}, PR = \sqrt{10}, QR = 10$
 $\angle QPR$ is a right angle
 (d) 18°
 (e) $x - 3y + 5 = 0$



- (b) $P(4, 5)$ (d) Slope of $PS = 5.$
 $Q(10, 4)$ Slope of $QR = 5.$
 $R(11, 9)$ (e) $PQ = \sqrt{37}$
 $S(5, 10)$ $SR = \sqrt{37}$
 (c) $PS = \sqrt{26}$ (f) Slope of $PQ = -\frac{1}{6}.$
 $QR = \sqrt{26}$ Slope of $SR = -\frac{1}{6}.$

29. (a) Slope of $AE = \frac{4}{3}$, slope of $ED = -\frac{4}{3}.$
 (b) Equation of ED is $4x + 3y = 72$,
 of DC is $x = 12$, of AD is $y = 8.$
 (c) $4\sqrt{13}$ units
 (d) Length of $FG = 6$ units.
 (e) $\angle EDA = 53^\circ, \angle EAD = 53^\circ$

30. (a) 12 units (c) $25\frac{1}{7}$ units
 (b) $60, \frac{\pi}{3}$ rad (d) 18 units

31. (a)
-
- (b) $4\sqrt{5}$ units (h) At point $P(8\frac{1}{2}, 0)$
 (c) $2x + y - 8 = 0$ (i) $y = 8$
 (d) 63° At $K(6, 8)$
 (e) $5x - 2y - 20 = 0$ (j) 3 units
 (f) $\sqrt{29}$ units He fell in at $H(3, 8).$
 (g) $2x + y - 17 = 0$

32. 147 cm^3

33. (a) 18 kg

(b) 1.94 m

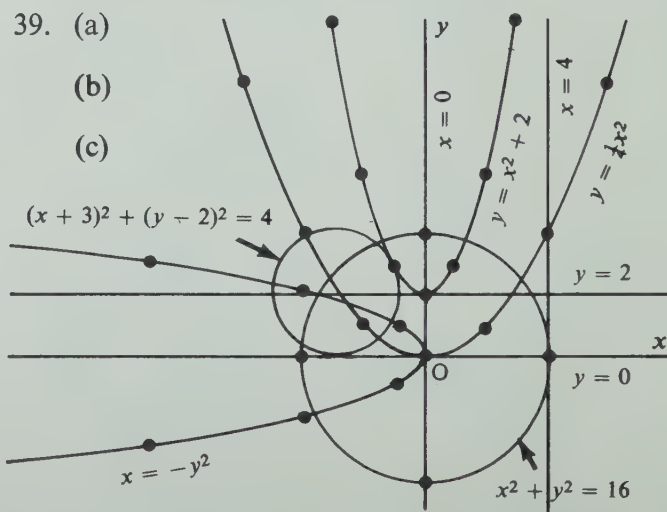
34. 125

35. 81.9 m

36. $56^\circ, 36 \text{ m}$

37. $a = 42, b = 48, c = 48, d = 42$

38. $a = 17, b = 55, c = 17, d = 35$



(d) $(x - 4)^2 + (y + 2)^2 = 1$

18.1 Get-Set Exercise, Page 317

1. (a) $\frac{13}{100}$ (d) $\frac{1}{400}$ (g) $\frac{1}{200}$
 (b) $\frac{1}{200}$ (e) $\frac{1}{2000}$ (h) $\frac{13}{400}$
 (c) $\frac{1}{2}$ (f) $\frac{1}{100}$ (i) $\frac{1}{3}$
2. (a) 25% (d) 37.5% (g) $66\frac{2}{3}\%$
 (b) 75% (e) 75% (h) 10%
 (c) 50% (f) $33\frac{1}{3}\%$ (i) 5%
3. (a) 40% (d) 50% (g) 90%
 (b) 18% (e) 25% (h) 75%
 (c) 46% (f) 37.5% (i) 133%
4. History 90% English 60%
 Geography 72% Mathematics 70%
 Biology 74%

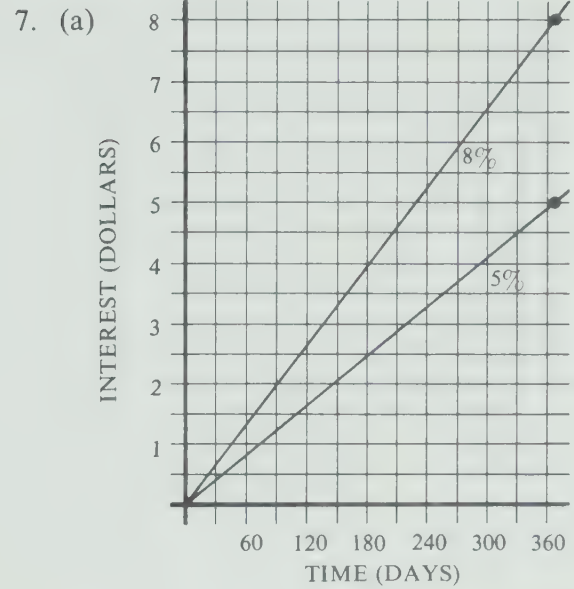
Exercise 18.2, Page 319

1. (a) \$5.00 (d) \$44.10
 (b) \$200.00 (e) \$11.25
 (c) \$20.00 (f) \$90.00
2. (a) \$135.00 (f) \$7.68
 (b) \$36.55 (g) \$5.48
 (c) \$1.05 (h) \$69.31
 (d) \$43.15 (i) \$90.00
 (e) \$15.44 (j) \$29.70
3. (a) \$738.76 (f) \$1218.00
 (b) \$2994.60 (g) \$1527.89
 (c) \$499.20 (h) \$1006.67
 (d) \$1090.10 (i) \$739.75
 (e) \$2304.98 (j) \$2505.48
4. \$2832.00
5. \$2229.42
6. \$56.00
7. \$8923.88
8. \$1708.00

Exercise 18.3, Page 322

1. (a) 25% (d) $4\frac{1}{8}\%$
 (b) 22.5% (e) 6%
 (c) 2.5% (f) 5.5%
2. (a) \$125 (d) \$3657.92
 (b) \$405 (e) \$1460
 (c) \$1120.88 (f) \$4921.57
3. (a) 183 (d) 365
 (b) 256 (e) 110
 (c) 90 (f) 37

4. Interest was \$318.75
 Amount would be \$2818.75.
5. \$1000
6. 91 days



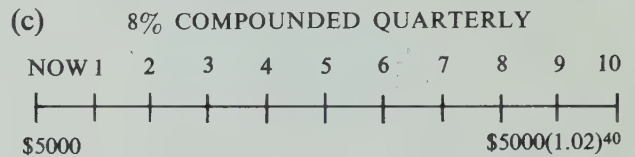
- (b) (i) 80¢, \$1.20, \$3.40
 (ii) \$12.00, \$23.00, \$34.00
 (iii) 335 days, 210 days

Exercise 18.4, Page 327

1.	Interest Calculation Period (One-half year)	Principal at Start of Period	Amount at End of Period
	1	100	100 (1.03)
	2	100 (1.03)	100 (1.03) ²
	3	100 (1.03) ²	100 (1.03) ³
	4	100 (1.03) ³	100 (1.03) ⁴
	.	.	.
	.	.	.
	.	.	.
	18	100 (1.03) ¹⁷	100 (1.03) ¹⁸
	19	100 (1.03) ¹⁸	100 (1.03) ¹⁹
	20	100 (1.03) ¹⁹	100 (1.03) ²⁰

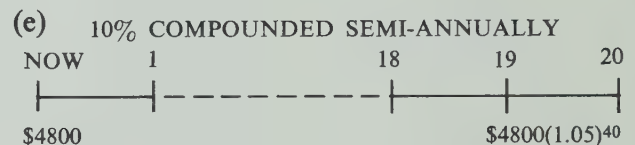
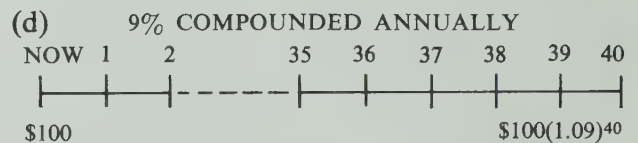
2. Annual interest rate (i)	6%	8%	10%	12%	9%	4%	7%	5%	3%
Number of times the interest is calculated per year	4	2	4	12	3	4	3	12	3
Interest rate for each period	1.5%	4%	2.5%	1%	3%	1%	2.3%	0.4%	1%

3. (a) $\$2000 (1.05)^{10}$ (f) $\$110 (1.02)^{30}$
 (b) $\$300 (1.02)^{16}$ (g) $\$5000 (1.0075)^{11}$
 (c) $\$25 (1.07)^{20}$ (h) $\$28 (1.005)^{72}$
 (d) $\$250 (1.01)^{36}$ (i) $\$750 (1.0225)^{40}$
 (e) $\$1500 (1.02)^{14}$ (j) $\$900 (1.05)^9$

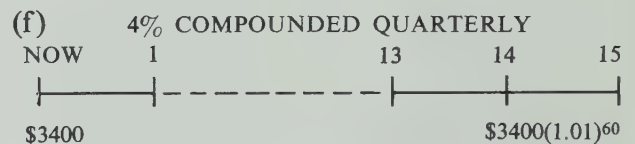


Exercise 18.5, Page 329

1. End of Year	6%	8%
10	\$179.09	\$ 215.89
11	189.83	233.16
12	201.22	251.82
15	239.66	317.22
20	320.71	466.10
30	574.35	1006.27

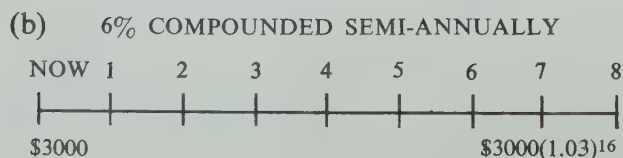
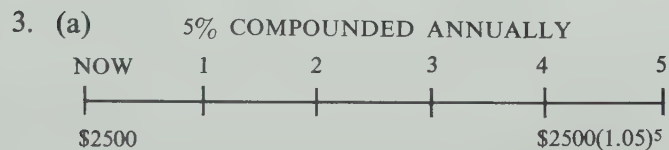


2. (a) 141.30 (d) 1316.81
 (b) 98.36 (e) 1183.82
 (c) 45.35
3. (a) \$476.41 (e) \$805.26
 (b) \$477.62 (f) \$1326.65
 (c) \$478.25 (g) \$3187.70
 (d) \$478.67



Exercise 18.6, Page 331

2. (a) \$1276.28 (c) 122.02
 (b) \$2220.36 (d) \$78.28



Principal	Rate	Time (years)	Compounded	Amount
\$100	9%	5½	semi-annually	$100(1.045)^{11}$
\$500	4%	14	annually	$500(1.04)^{14}$
\$400	6%	2	quarterly	$400(1.015)^8$
\$30	4%	4	quarterly	$30(1.01)^{16}$
\$1000	9%	3	monthly	$1000(1.0075)^{36}$

5. \$1902.36

6. (a) \$3173.74
 (b) \$3022.14
 (c) \$2859.00

The best choice is (a).

7. \$579.18
8. \$30 652.05
9. \$53 973.25
10. \$400.00
11. \$1549.48
12. \$3028.76
13. \$4902.00
14. Total interest earned by trust company was \$3954.62. Jill lost \$3954.62
3. (a) \$1100.92 (d) \$735.71
(b) \$723.81 (e) \$693.75
(c) \$234.78
4. (a) \$162.80 (d) \$76.64
(b) \$56.77 (e) \$1717.00
(c) \$193.20
5. 65¢
6. \$86.25
7. \$93.75
8. \$172.50
9. \$51 520
10. 75%, 66 $\frac{2}{3}$ %, 83 $\frac{1}{3}$ %, 108%, 116 $\frac{2}{3}$ %, 24%

Exercise 19.1, Page 338

6. \$10.64
7. 25.06%
8. \$150
9. (a) -\$264
(b) \$216
(c) \$48
10. (a) \$23.57
(b) \$9.43
(c) Loss is \$2.36
11. (a) \$31.20
(b) \$2.40

Exercise 19.3, Page 343

1. (a) (i) April 14 (d) (ii) November 21
(ii) April 19 (e) (i) December 17
(b) (i) June 26 (ii) January 2
(ii) July 11
(c) (i) August 27
(ii) October 17

12.

Item	Selling Price	Prime Cost	Overhead	Gross Cost	Markup	Profit
1	\$1500	\$950	\$250	\$1200	\$550	\$300
2	\$45	\$25.50	\$7.50	\$33	\$19.50	\$12
3	\$125	\$68.50	\$33.50	\$102	\$56.50	\$23
4	\$1052.50	\$618	\$219.50	\$837.50	\$434.50	\$215
5	\$70.20	\$59.15	\$6.25	\$65.40	\$11.05	\$4.80
6	\$225	\$143	\$29	\$172	\$82	\$53
7	\$21.70	\$17.40	\$2.10	\$19.50	\$4.30	\$2.20
8	\$2105	\$1236	\$439	\$1675	\$869	\$430

2. (a) \$70.00 (d) (a) \$85.59
(b) \$72.68 (b) \$535.16
(c) \$80.75 (c) \$109.21
3. (a) \$71.50 (d) \$623.69
(b) \$59.84 (e) \$1480.08
(c) \$508.85
(d) \$172.98
(e) \$1258.32

Exercise 19.2, Page 340

1. (a) 20.5% (d) 40.9%
(b) 9.8% (e) 11.6%
(c) 29.6%
2. (a) \$874.00 (d) \$103.68
(b) \$233.10 (e) \$3020.00
(c) \$450.00
5. (a) March 29, April 14, June 14
(b) \$220.67, \$222.95, \$113.74
(c) \$557.36
6. (a) April 28, May 18
(b) \$241.65, \$246.57
(c) \$488.22
7. (a) October 20, November 10
(b) \$617.70, \$424.54
(c) \$1042.24

Exercise 19.4, Page 346

1. (a) \$350.00 (d) \$400.00
(b) \$38.20 (e) \$87.68
(c) \$125.00
2. (a) 8.3% (d) 12.5%
(b) 30% (e) 1%
(c) 6%
3. (a) \$312.75
(b) \$1451.25
(c) \$286.25
4. (a) \$255.60 (d) \$1148.45
(b) \$190.00 (e) \$1045.76
(c) \$1630.00
5. \$230.40
6. \$2650
7. (a) \$31.50 (d) \$210.28
(b) \$16.48 (e) \$19.70
(c) \$106.80

Exercise 20.1, Page 351

1. (a) 42 m (c) 34.25 cm
(b) 124 m (d) 40 m
2. Length is 24 cm, width is 22 cm.
Perimeter is 92 cm.
3. (a) 176 cm (d) 18 m
(b) 120 m (e) 7.5 cm
(c) 32 cm (f) 198 mm
4. 360 cm
5. $2.08 \text{ m} \times 2.08 \text{ m}$ 10. 47.8 m
6. $10 \text{ m} \times 12 \text{ m}$ 11. 120 cm
7. 352 m 12. 13.82 m
8. 6.57 m 13. 4.1 m
9. 246 m 14. 7 m

Exercise 20.2, Page 354

5. (a) 16 cm^2 (c) 28.8 cm^2 (e) 330 mm^2
(b) 42 cm^2 (d) 195 mm^2 (f) 6776 m^2
6. (a) 1.74 m^2
(b) 1.21 m^2
Area available is 0.066 m^2

7. Area of triangles = 42 cm^2 and 117 cm^2
Area of unshaded section = 561 cm^2
8. 158.4 m^2
9. 54 m^2
10. \$7.00
11. 1.716 m^2 , 21.45%
12. 0.72 m^2 , 1.32 m^2
13. 1476 cm^2 , 585 cm^2 , $23\ 539 \text{ cm}^2$
14. 72 m^2
15. (a) 52 cm^2 (c) 147 mm^2
(b) 224 m^2 (d) 6705.6 cm^2

Exercise 20.3, Page 358

2. (a) 360 cm^2 (c) 182 cm^2
(b) 1760 cm^2 (d) 160 cm^2
3. 214 cm^2
4. 235 cm^2
5. \$7.29
6. 38.2 cm
7. 8 sections, approximately 5800 cm^2

Exercise 20.4, Page 360

2. (a) 480 cm^3 (d) 60 m^3
(b) 24 cm^3 (e) 31.05 m^3
(c) 56.52 m^3
3. 90 m^3 , 22.5 loads
4. 90 kl
6. 137 ℓ (approximately)
7. 1503.9 ℓ
8. 35.4 cm
9. 8.925 "cubes" (say 9), \$270
10. Approximately 72.5, 690 cars
11. None!

MBS Exercise 5, Page 364

1.

	<i>Principal</i>	<i>Rate of Interest</i>	<i>Time</i>	<i>Interest</i>
(a)	\$300	5%	3 years	\$45.00
(b)	\$250	12%	7 years	\$210.00
(c)	\$800	6%	5 months	\$20.00
(d)	\$600	8%	4 years	\$192.00
(e)	\$200	6%	4 months	\$4.00
(f)	\$400	11%	9 months	\$33.00
(g)	\$100	9%	219 days	\$5.40
(h)	\$50	14%	73 days	\$1.40
(i)	\$150	15%	292 days	\$18.00
(j)	\$80	12%	146 days	\$3.84
(k)	\$1000	9%	2 years	\$180.00
(l)	\$200	5½%	348 days	\$10.50

7.

<i>Cost Price</i>	<i>Selling Price</i>	<i>Profit</i>	<i>Rate of Profit</i>
\$370	\$450	\$80	21.6%
\$26	\$45	\$19	73.1%
\$50	\$80	\$30	60%
\$90	\$130.50	\$40.50	45%
\$6	\$12	\$6	100%
\$250	\$500	\$250	100%
\$200	\$250	\$50	25%
\$60	\$90	\$30	50%

8.

<i>Cost Price</i>	<i>Selling Price</i>	<i>Loss</i>	<i>Rate of Loss</i>
\$120	\$108	\$12	10%
\$380	\$361	\$19	5%
\$90	\$70	\$20	22⅔%
\$150	\$100	\$50	33⅓%
\$80	\$60	\$20	25%
\$200	\$175	\$25	12½%
\$12	\$8	\$4	33⅓%
\$1000	\$800	\$200	20%

2.

	<i>Principal</i>	<i>Rate</i>	<i>Time</i>	<i>Compounded</i>	<i>Amount (i)</i>	<i>Amount (ii)</i>
(a)	\$300	8%	6 years	annually	300 (1.08) ⁶	\$476.06
(b)	\$60	10%	8 years	semi-annually	60 (1.05) ¹⁶	\$130.97
(c)	\$500	12%	5 years	quarterly	500 (1.03) ²⁰	\$903.06
(d)	\$40	9%	15 years	annually	40 (1.09) ¹⁵	\$145.70
(e)	\$200	7%	2 years	semi-annually	200 (1.035) ⁴	\$229.50
(f)	\$130	24%	7 months	monthly	130 (1.02) ⁷	\$149.33
(g)	\$2000	20%	5 years	quarterly	2000 (1.05) ²⁰	\$5306.60

9. \$224

10. \$595

11. 833⅓ dozen

3. \$12 750.80

4. \$2633.95

5. Mary will have approximately 81¢ more than Barbara.

12.

<i>List Price</i>	<i>Trade Discount</i>	<i>Amount Owning</i>
\$300	25%	\$225.00
\$120	20%, 10%	\$86.40
\$50	33⅓%	\$33.33
\$80	30%, 5%	\$53.20
\$240	25%, 10%, 5%	\$153.90

6.

	<i>Selling Price</i>	<i>Prime Cost</i>	<i>Overhead % of Prime</i>	<i>Gross Cost</i>	<i>Markup % of Prime</i>	<i>Profit</i>
(a)	\$310	\$200	25%	\$50	55%	\$110
(b)	\$600	\$400	20%	\$80	50%	\$200
(c)	\$120	\$80	10%	\$8	50%	\$40
(d)	\$100	\$60	16⅔%	\$10	66⅔%	\$40
(e)	\$750	\$500	10%	\$50	50%	\$250

13.	Amount of Invoice	Terms	Amount Owning
	\$42	2/10, n/30	\$41.16
	\$200	3/20, n/60	\$194.00
	\$150	3/20, 2/30, n/40	\$145.50
	\$1000	5/10, 1/20, n/30	\$950.00
	\$120	4/10, 2/20, n/30	\$115.20

14.	Sales	Rate	Commission
	\$6500	3%	\$195.00
	\$170	4%	\$6.80
	\$12 600	0.5%	\$63.00
	\$1250	2%	\$25
	\$320	5%	\$16

15. \$266

16. \$6000

17. (a) 38 cm, 84 cm²
 (b) 126 cm, 1257 cm²
 (c) 60 cm, 150 cm²
 (d) 66 m, 240 m²

18. (a) 88 cm²
 (b) 56 m²
 (c) 96 m²

19. (a) 150 cm², 125 cm³
 (b) 245 m², 283 m³
 (c) 414 m², 484 m³
 (d) 192 mm², 144 mm³
 (e) 547 cm², 811 cm³
 (f) 280 m², 240 m³

20. (a) 471 m³
 (b) 194 m²
 (c) \$213.46

Get-Set Exercise, Page 379

- A 1. (a) 1:3 (d) 1:9 (g) 4:3
 (b) 1:2 (e) 3:1 (h) 3:2
 (c) 2:3 (f) 5:3 (i) 4:1

2. Equivalent ratios in parts
 (a), (b), (f), (g), (j)

4. (a) $x = 10$ (f) $x = 66$
 (b) $x = 12$ (g) $x = 12$
 (c) $x = 4.5$ (h) $x = 51$
 (d) $x = 20$ (i) $x = 2$
 (e) $x = 81$ (j) $x = \pm 4$

5. (a) 1:50 (c) 1:20
 (b) 8:1 (d) 2:15

6. (a) 3:2
 (b) 3:2
 (c) 9:4

7. (a) 2:1
 (b) 2:1
 (c) 2:1
 (d) 4:1

8. (a) 5:2
 (b) 5:1
 (c) 5:3

- B 1. (a) $x = 4$ (e) $x = 46$
 (b) $x = 3$ (f) $x = 10$
 (c) $x = 3$ (g) $x = 16$
 (d) $x = 4$ (h) $x = 21$
 2. (a) $x = 5$ (c) $x = 12$
 (b) $x = 21$ (d) $x = 27$
 3. (a) 3.375 (e) ± 8
 (b) 15 (f) 96
 (c) ± 4 (g) 2
 (d) 5 (h) ± 10

Exercise 22.1, Page 381

1. 7:5 8. 175 min
 (2 h 55 min)
 2. 3:7 9. 2.6 s
 3. $\frac{1}{4}$ 10. 150 rivets
 4. $\frac{1}{5}$ 11. 19.3 kg
 5. 15 days 12. 413 men
 6. 240 min 13. Would you believe
 7. 180 cars 44 days?

Exercise 22.2, Page 384

1. A ~ H
B ~ G
C ~ F
D ~ E
2. (a) $\frac{4}{3}$ (d) 7
(b) 9 (e) $a = 20, b = 8$
(c) 18
3. (a) ED
(b) DF
(c) FE
4. $\frac{AB}{ED} = \frac{BC}{DF} = \frac{CA}{FE}$
5. (a) $a = 14, b = 9$
(b) $a = 10, b = 8$
6. $x = 4, y = 2\sqrt{5}, z = 4\sqrt{5}$
7. (a) $x = 5\frac{3}{5}, y = 11\frac{1}{4}$
(b) $a = 18, b = 16$
(c) $a = 12, b = 3\frac{1}{2}, c = 17\frac{1}{7}$
(d) $a = 14, b = 45$
8. (a) $a = 12$ (d) $x = 9$
(b) $x = 6, y = 12$ (e) $x = 21, y = 2\frac{6}{7}$
(c) $x = 20, y = 10$ (f) $x = 6, y = 12, z = 7$

Exercise 22.3, Page 389

3.

DRIVER		FOLLOWER	
Number of teeth	r/min	Number of teeth	r/min
(a)	36	100	24
(b)	64	300	96
(c)	33	80	24
(d)	24	160	64
(e)	28	320	64
(f)	24	225	40
(g)	80	150	75
(h)	80	50	20
(i)	24	1200	128
(j)	26	570	78
(k)	54	50	180
(l)	30	1700	24
(m)	42	100	30

4. (a) 160 r/min, cw (e) $116\frac{2}{3}$ r/min, ccw
(b) 290 r/min, cw (f) 27 r/min, ccw
(c) 480 r/min, cw (g) 2000 r/min, ccw
(d) 1280 r/min, cw (h) $3733\frac{1}{3}$ r/min, cw

Exercise 22.4, Page 392

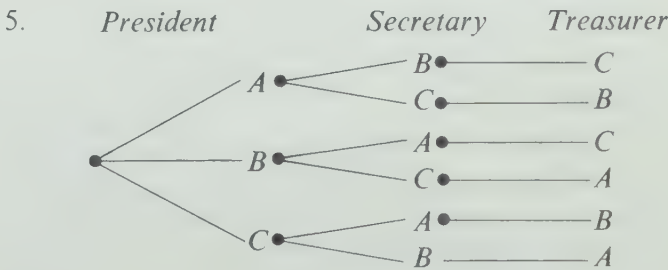
4.

DRIVER		FOLLOWER	
Diameter (centimetres)	r/min	Diameter (centimetres)	r/min
(a)	6	1500	18
(b)	6	400	8
(c)	12	$533\frac{1}{3}$	8
(d)	14	1800	12
(e)	3	1600	4
(f)	9	600	6
(g)	20	900	8
(h)	27	250	9
(i)	4	450	12
(j)	12	1200	18
(k)	18	400	36
(l)	12	1095	9

5. 2475 r/min
6. 840 r/min
7. 4 cm
8. approximately 60 km/h

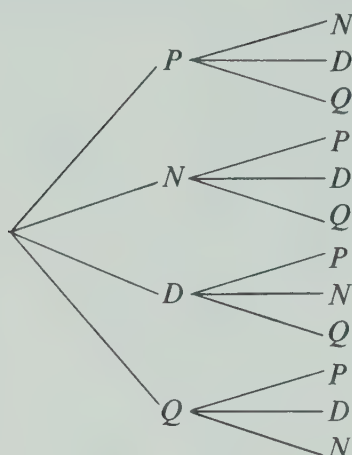
Exercise 23.1, Page 399

1. $\frac{3}{8}$ 3. $\frac{11}{12}$
2. (a) $\frac{5}{9}$ (b) $\frac{4}{9}$ 4. (a) $\frac{3}{8}$ (b) $\frac{5}{8}$ (c) $\frac{1}{4}$



6.

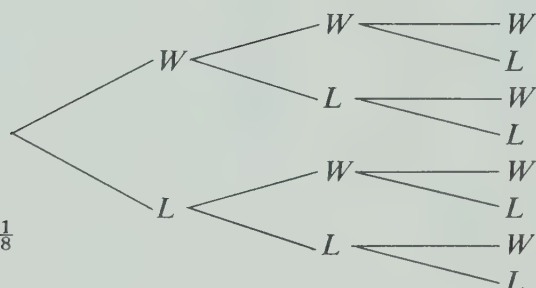
First Draw Second Draw



$\frac{1}{6}$

7.

First Game Second Game Third Game



$\frac{1}{8}$

8. $\frac{13}{37}$

9. $\frac{7}{4} \div \frac{4}{7}$

10. $\frac{1}{1}$

11. (a) $\frac{1}{1}$ (b) $\frac{1}{12}$ (c) $\frac{1}{12}$

Exercise 23.2, Page 402

1. 1024

2. $60 \times 59 \times 58 \dots 22 \times 21$ or $\left(\frac{60!}{20!}\right)$

3. (a) 30 (b) 35 (c) 210

4. 64

5. (a) 676 (b) 1000 (c) 676 000
(allowing repetitions of letters and digits)

6. 17 576 (allowing repetitions)

7. 8000

8. (b) 12 (c) Three 7's

Exercise 23.3, Page 405

1. $7! = 5040$

7. 9900

2. $7! = 5040$

8. $\frac{9!}{3!} = 60\,480$

3. $5! = 120$

9. 120

4. $8! = 40\,320$

10. $8! = 40\,320$

5. $4! = 24$

11. 504

6. 120

12. $6! = 720$

Exercise 23.4, Page 407

1. 10

2. $\frac{100!}{95!5!} = 75\,287\,520$

3. $\frac{8!}{6!2!} = 28$

4. (a) 210

(b) 10

5. 6

8. 105

7. 35

9. $\frac{17!}{13!4!} = 2380$

MBS Exercise 6, Page 410

4. (a) 12

(d) $\frac{3}{4}$

(b) 12

(e) 6

(c) $\frac{8}{5}$

(f) $\frac{28}{3}$

5. (a) 10

(d) $\frac{5}{4}$

(b) 8

(e) $\frac{3}{4}$

(c) 9

(f) $\frac{5}{2}$

6. (a) 50:1

(b) 10:1

(c) 50:1

7. (a) (i) 1:1

(ii) 10:9

(b) (i) 1:3

(ii) 5:54

8. (a) (i) $p = 13$ cm, $q = 5$ cm
 (ii) 5:2
 (iii) 5:1
 (b) (i) $p = 1.5$ m, $q = 6$ m
 (ii) 1:4
 (iii) 1:16

9. (a) 6 cm
 (b) 8 m
 (c) $6\sqrt{2}$ km

10. 4

	Driver		Follower	
	no. of teeth	r/min	no. of teeth	r/min
(a)	24	200	40	120
(b)	30	80	20	120
(c)	15	600	45	200
(d)	49	100	35	140
(e)	60	360	180	120
(f)	84	17	21	68

12. (a) $a = 6$, $b = 12$ (d) $s = 3$, $r = 9$
 (b) $c = 3$, $d = 16$ (e) $t = \frac{20}{3}$, $w = 9$
 (c) $g = 12$, $h = \frac{27}{2}$ (f) $p = 2\sqrt{5}$, $y = 5$

13. (a) $\frac{1}{2}$
 (b) $\frac{1}{2}$
 (c) 1

14. (a) $\frac{1}{2}$ (c) $\frac{1}{4}$
 (b) $\frac{1}{13}$ (d) $\frac{1}{52}$

15. (a) $\frac{1}{18}$ (d) $\frac{1}{18}$
 (b) $\frac{1}{36}$ (e) $\frac{2}{9}$
 (c) $\frac{1}{6}$

16. (a) $\frac{5}{11}$ 19. (a) $\frac{2}{3}$
 (b) $\frac{4}{11}$ (b) $\frac{3}{5}$
 (c) $\frac{9}{11}$ (c) $\frac{7}{10}$

17. $\frac{1}{5}$

18. $\frac{1}{16}$

20. $\frac{3}{20}$

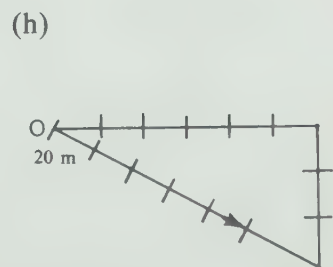
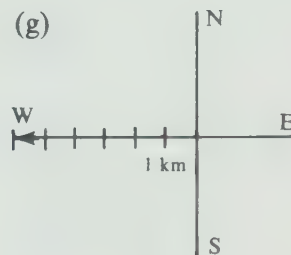
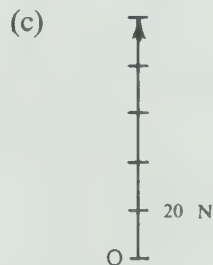
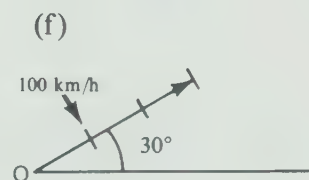
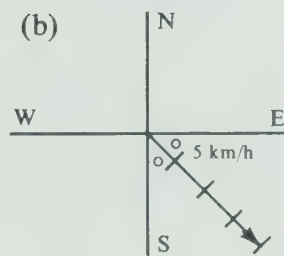
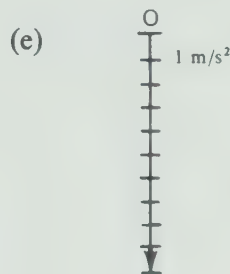
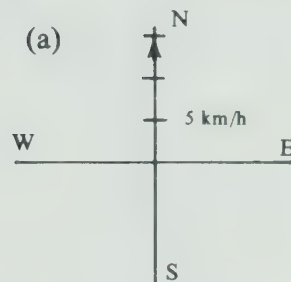
21. \$120

22. (a) $\frac{19}{20}$
 (b) 1264

Exercise 24.1, Page 418

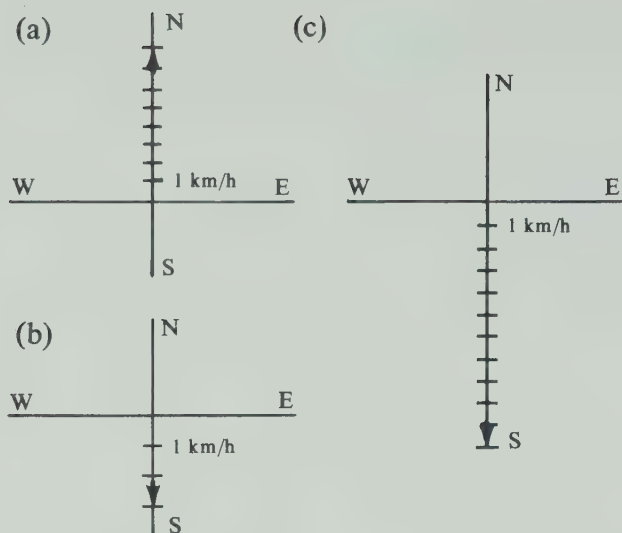
3. (a) 20 units, East (d) 6 units, Northeast
 (b) 4 units, E 30° N (e) 2 units, 225°
 (c) 10 units, South (f) 20 units, 315°

4.



5. (a) $\vec{DC}$, $\vec{AB}$, $\vec{AD}$, $\vec{BC}$
 (b) $\vec{SR}$, $\vec{PQ}$
 (c) None
 (d) $\vec{LM}$, $\vec{GH}$

6.

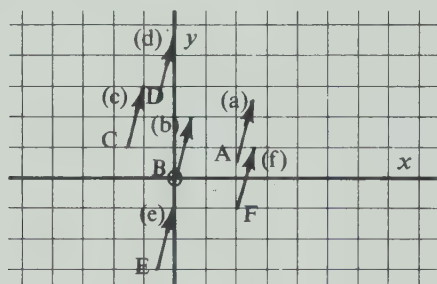
7. (a) $\vec{AB}$, $\vec{BA}$, $\vec{BC}$, $\vec{CB}$, $\vec{AC}$, $\vec{CA}$

8.

	<i>Equal Vectors</i>	<i>Opposite Vectors</i>
(a)	$\vec{ED}$, $\vec{AB}$ $\vec{AE}$, $\vec{BD}$	$\vec{ED}$, $\vec{BA}$ $\vec{AE}$, $\vec{DB}$
(b)	$\vec{VU}$, $\vec{RS}$ $\vec{SV}$, $\vec{TU}$	$\vec{VU}$, $\vec{SR}$ $\vec{SV}$, $\vec{UT}$
(c)	$\vec{AF}$, $\vec{CD}$ $\vec{EF}$, $\vec{CB}$ $\vec{BA}$, $\vec{DE}$	$\vec{AF}$, $\vec{DC}$ $\vec{EF}$, $\vec{BC}$ $\vec{BA}$, $\vec{ED}$
(d)	$\vec{EA}$, $\vec{DC}$	$\vec{EA}$, $\vec{CD}$

Exercise 24.2, Page 422

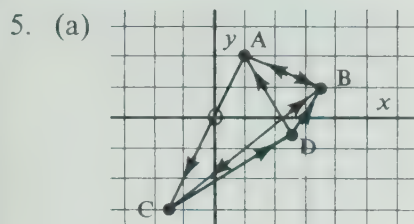
1.

2. (a) $\vec{(7, 5)}$ (b) $\vec{(1, 1)}$ (c) $\vec{(0, 8)}$ (d) $\vec{(1, 8)}$ (e) $\vec{(3, 6)}$ (f) $\vec{(10, 0)}$ (g) $\vec{(3, 5)}$ (h) $\vec{(3, 7)}$ (i) $\vec{(-6, 4)}$ (j) $\vec{(-5, 3)}$ (k) $\vec{(-2, 10)}$ (l) $\vec{(-5, 0)}$

3.

	<i>A</i>	<i>B</i>	<i>Run</i> <i>A to B</i>	<i>Rise</i> <i>A to B</i>	<i>(Run, Rise)</i>	$\vec{AB}$
(a)	(0, 0)	(7, 5)	$7 - 0 = 7$	$5 - 0 = 5$	(7, 5)	$\vec{(7, 5)}$
(b)	(1, 2)	(2, 3)	$2 - 1 = 1$	$3 - 2 = 1$	(1, 1)	$\vec{(1, 1)}$
(c)	(-1, -2)	(-1, 6)	$-1 + 1 = 0$	$6 + 2 = 8$	(0, 8)	$\vec{(0, 8)}$
(d)	(-3, -4)	(-2, 4)	$-2 + 3 = 1$	$4 + 4 = 8$	(1, 8)	$\vec{(1, 8)}$
(e)	(3, -2)	(6, 4)	$6 - 3 = 3$	$4 + 2 = 6$	(3, 6)	$\vec{(3, 6)}$
(f)	(-5, 0)	(5, 0)	$5 + 5 = 10$	$0 - 0 = 0$	(10, 0)	$\vec{(10, 0)}$
(g)	(-1, -4)	(2, 1)	$2 + 1 = 3$	$1 + 4 = 5$	(3, 5)	$\vec{(3, 5)}$
(h)	(1, -5)	(4, 2)	$4 - 1 = 3$	$2 + 5 = 7$	(3, 7)	$\vec{(3, 7)}$
(i)	(7, 2)	(1, 6)	$1 - 7 = -6$	$6 - 2 = 4$	(-6, 4)	$\vec{(-6, 4)}$
(j)	(-1, -1)	(-6, 2)	$-6 + 1 = -5$	$2 + 1 = 3$	(-5, 3)	$\vec{(-5, 3)}$
(k)	(1, -3)	(-1, 7)	$-1 - 1 = -2$	$7 + 3 = 10$	(-2, 10)	$\vec{(-2, 10)}$
(l)	(1, 0)	(-4, 0)	$-4 - 1 = -5$	$0 - 0 = 0$	(-5, 0)	$\vec{(-5, 0)}$

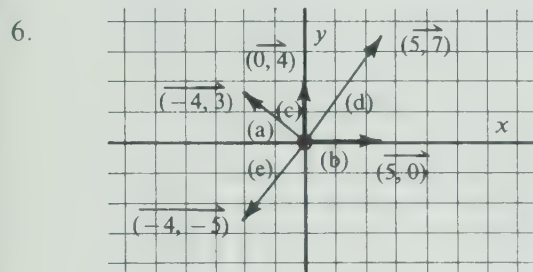
4. $\overrightarrow{AB} = (7, 4)$ $\overrightarrow{JK} = (-4, 5)$
 $\overrightarrow{CD} = (7, -6)$ $\overrightarrow{LM} = (5, -7)$
 $\overrightarrow{EF} = (4, 7)$ $\overrightarrow{PQ} = (2, -4)$
 $\overrightarrow{GH} = (6, 0)$ $\overrightarrow{RS} = (0, -8)$
 $\overrightarrow{TV} = (-5, -8)$



$\overrightarrow{AB} = (5, -2)$ $\overrightarrow{CD} = (8, 5)$
 $\overrightarrow{BA} = (-5, 2)$ $\overrightarrow{DA} = (-3, 5)$
 $\overrightarrow{BC} = (-10, -8)$ $\overrightarrow{AC} = (-5, -10)$
 $\overrightarrow{CB} = (10, 8)$ $\overrightarrow{DB} = (2, 3)$

(b) Same as (a)

(c) $(-5, 2), (5, -2), (10, 8), (-10, -8)$
 $(-8, -5), (3, -5), (5, 10), (-2, -3)$



7. (a) $(0, 50)$ (c) $(100\sqrt{2}, 100\sqrt{2})$
(b) $(100, 0)$ (d) $(0, -70)$

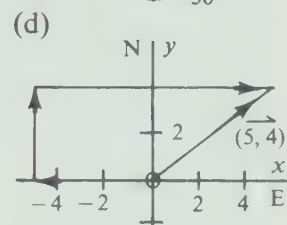
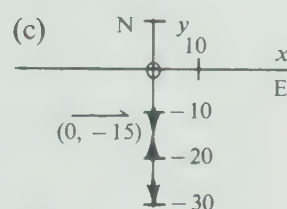
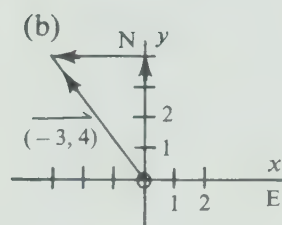
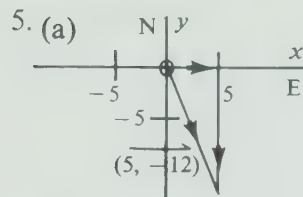
Exercise 24.3, Page 425

1. (a) $\overrightarrow{AC}$ (c) $\overrightarrow{AC}$
(b) $\overrightarrow{BA}$ (d) $\overrightarrow{AE}$

2. (a) $(4, 6)$ (f) $(-4, 5)$
(b) $(-6, 2)$ (g) $(5, 2)$
(c) $(1, -2)$ (h) $(-9, -9)$
(d) $(4, 4)$ (i) $(7, 3)$
(e) $(2, 0)$ (j) $(-4, 4)$

3. (a) $(8, 12)$ (e) $(7, 9)$
(b) $(1, 2)$ (f) $(1, -4)$
(c) $(5, -3)$ (g) $(-2, 7)$
(d) $(4, 1)$ (h) $(a + c, b + d)$

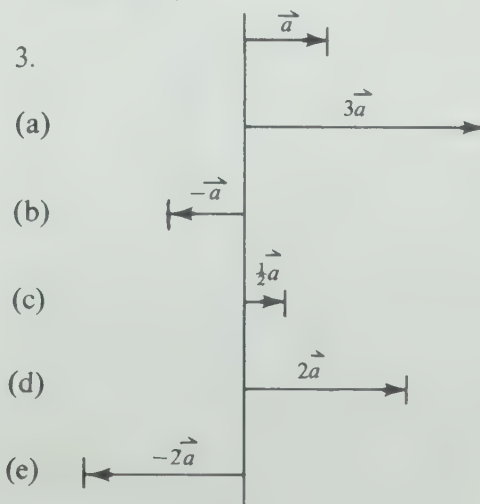
4. (a) $(-3, 7)$ (d) $(-2, -5)$
(b) $(0, 0)$ (e) $(5, -5)$
(c) $(4, -3)$ (f) $(-7, -8)$

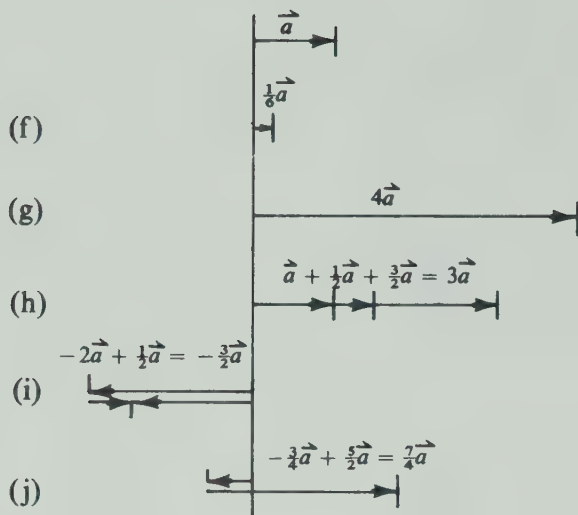


Exercise 24.4, Page 427

1. (a) $(3, 6)$ (f) $(-4, -6)$
(b) $(3, 4)$ (g) $(\frac{7}{3}, -1)$
(c) $(6, 4)$ (h) $(-2, -\frac{2}{5})$
(d) $(-14, 7)$ (i) $(12, -8)$
(e) $(2, \frac{1}{2})$ (j) $(14, 7)$

2. (a) $(9, 8)$ (e) $(-3, 1)$
(b) $(4, 1)$ (f) $(1, 8)$
(c) $(-21, 0)$ (g) $(0, 0)$
(d) $(5, 9)$



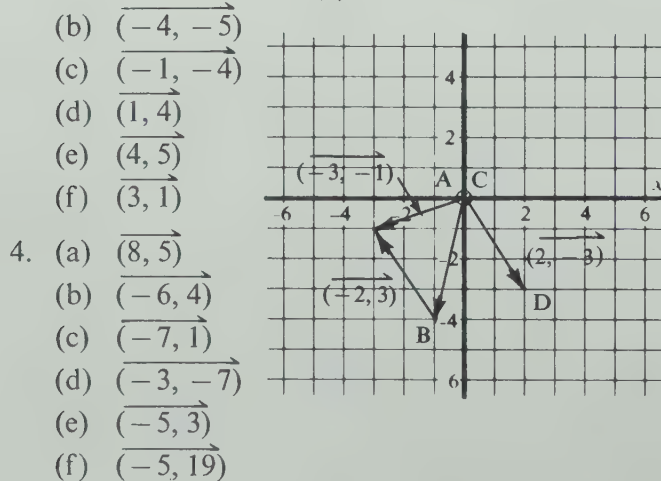


4. (a) $\overrightarrow{(-2, 3)}$ (d) $\overrightarrow{(1, 2)}$
 (b) $\overrightarrow{(2, -1)}$ (e) $\overrightarrow{(14, 6)}$
 (c) $\overrightarrow{(5, 2)}$
5. (a) $\overrightarrow{(3a, 4b)}$ (d) $\overrightarrow{(-2a, -3b)}$
 (b) $\overrightarrow{(7a, 11b)}$ (e) $\overrightarrow{(-a, -3b)}$
 (c) $\overrightarrow{(\frac{7}{2}a, \frac{13}{2}b)}$

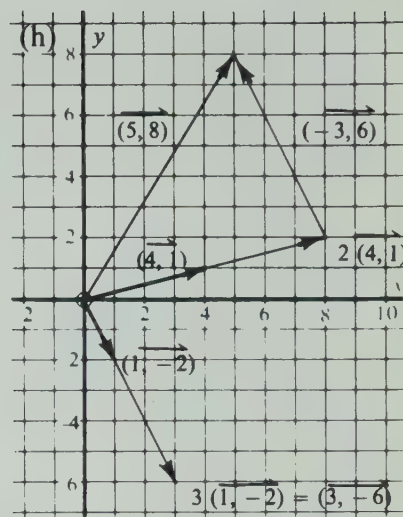
Exercise 24.5, Page 428

1. (a) $\overrightarrow{(10, 24)}$ (f) $\overrightarrow{(-3, -3)}$
 (b) $\overrightarrow{(1, -1)}$ (g) $\overrightarrow{(3, 2)}$
 (c) $\overrightarrow{(-12, -8)}$ (h) $\overrightarrow{(10, 3)}$
 (d) $\overrightarrow{(2, 10)}$ (i) $\overrightarrow{(-5, 1)}$
 (e) $\overrightarrow{(6, 2)}$ (j) $\overrightarrow{(-43, 32)}$
2. (a) $\overrightarrow{(-28, 10)}$ (e) $\overrightarrow{(3, 3)}$
 (b) $\overrightarrow{(-12, -6)}$ (f) $\overrightarrow{(13, 10)}$
 (c) $\overrightarrow{(8, 13)}$ (g) $\overrightarrow{(4, 2)}$
 (d) $\overrightarrow{(3, -2)}$ (h) $\overrightarrow{(-14, -6)}$

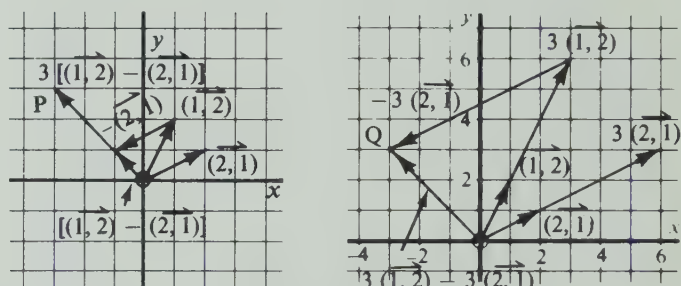
3. (a) $\overrightarrow{(-3, -1)}$ 3. (a)



- (g) $\overrightarrow{(21, -16)}$
 (h) $\overrightarrow{(5, 8)}$
 (i) $\overrightarrow{(3, -15)}$
 (j) $\overrightarrow{(6, -6)}$



5. (a)



- $\overrightarrow{OP} = \overrightarrow{OQ}$
 $3[(1, 2) - (2, 1)] = 3(1, 2) - 3(2, 1)$
6. (a) $\overrightarrow{(1, 0)}$
 (b) $\overrightarrow{(-1, -4)}$
 (c) $\overrightarrow{(1, 4)}$
 (d) $\overrightarrow{(8, 4)}$
 (e) $\overrightarrow{(-8, -14)}$
7. (a) $\overrightarrow{(-3, -1)}$
 (b) $\overrightarrow{(3, 7)}$
 (c) $\overrightarrow{(-1, 0)}$
 (d) $\overrightarrow{(2, 6)}$

Exercise 24.6, Page 433

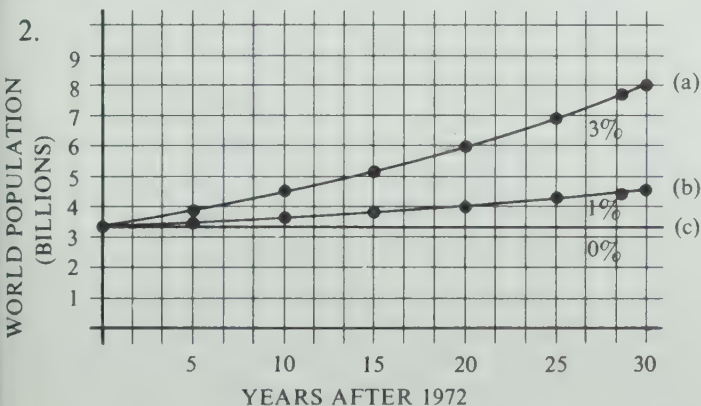
1. (a) $\overrightarrow{(12 \cos 25^\circ, 12 \sin 25^\circ)}$ (f) $\overrightarrow{(0, 3)}$
 $= (10.8756, 5.0712)$
 (b) $\overrightarrow{(5\sqrt{3}, 5)}$ (g) $\overrightarrow{(0, 7)}$
 (c) $\overrightarrow{(2\sqrt{2}, 2\sqrt{2})}$ (h) $\overrightarrow{(5, 0)}$
 (d) $\overrightarrow{(2, -2\sqrt{3})}$ (i) $\overrightarrow{(-\sqrt{2}, \sqrt{2})}$
 (e) $\overrightarrow{(-\sqrt{2}, -\sqrt{2})}$ (j) $\overrightarrow{(-\frac{3\sqrt{3}}{2}, \frac{3}{2})}$
2. (a) $3\sqrt{5} / 63^\circ$ (f) $2 / 90^\circ$
 (b) $4\sqrt{2} / 135^\circ$ (g) $5 / 323^\circ$
 (c) $\sqrt{10} / 18^\circ$ (h) $3 / 270^\circ$
 (d) $1 / 315^\circ$ (i) $5 / 127^\circ$
 (e) $5 / 0^\circ$ (j) $6 / 180^\circ$

3. (a) $50 / 270^\circ$ (d) $10 / 270^\circ$
 (b) $20 / 180^\circ$ (e) $30 / 45^\circ$
 (c) $40 / 30^\circ$
4. $10\sqrt{20} / 63^\circ$ or $44.72 / 63^\circ$
5. $(250\sqrt{2}, 250\sqrt{2})$
6. $2\sqrt{3} / 120^\circ$ or $3.464 / 120^\circ$

Exercise 24.7, Page 436

1. $(5, 12), 13 / 67^\circ$
2. $(7, 7), 9.8994 / 45^\circ$
3. $11.18 / 63^\circ$
4. $403 / 6^\circ$
5. $206 / 44^\circ$
6. $85 / 52^\circ$
7. 82 N
8. 41, 32 respectively
9. 5189 N (horizontal), 2310 N (vertical)
10. 208 N
11. $2.6 / 101^\circ$
12. N 9° W, 247 km/h
13. $198 / 90^\circ$
14. 88 N to submerge the log
 66 N to move it through the water.
15. 366 N

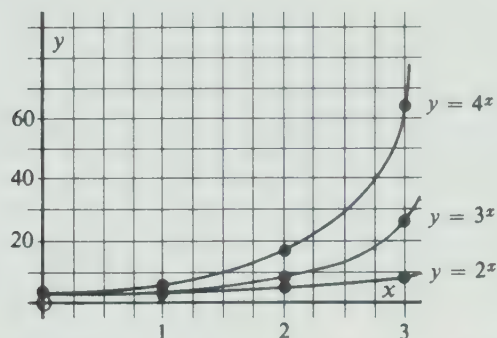
Exercise 25.1, Page 442



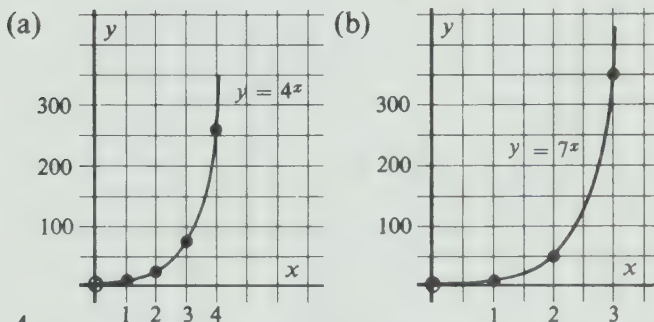
3. (a) 10.2 years
 (b) 20.5 years
 (c) 30.7 years
 (d) 41.0 years
4. (a) 11.9 years, 23.8 years, 35.7 years, 47.6 years
 (b) 7.3 years, 14.5 years, 21.8 years, 29.1 years

Exercise 25.2, Page 444

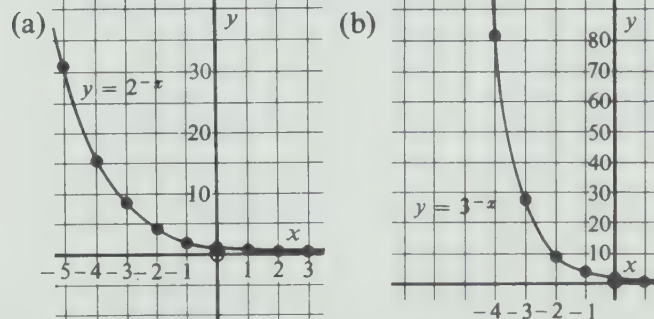
2.



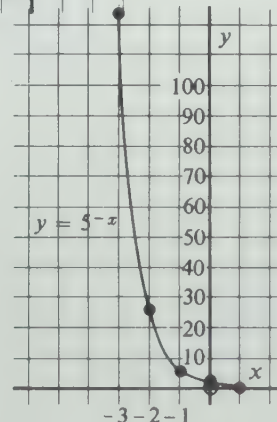
3.



4.



(c)



6. (a) No (c) No
(b) No (d) Decreases

Exercise 25.3, Page 447

- (a) 2.00 (e) 7.94 (i) 2.24
(b) 1.59 (f) 1.91 (j) 1.79
(c) 3.16 (g) 2.82 (k) 1.41
(d) 5.01 (h) 4.47 (l) 8.32
- (a) $100 \cdot 362$ (e) $100 \cdot 653$ (i) $100 \cdot 623$
(b) $100 \cdot 748$ (f) $100 \cdot 204$ (j) $100 \cdot 462$
(c) $100 \cdot 857$ (g) $100 \cdot 940$ (k) $100 \cdot 699$
(d) $100 \cdot 978$ (h) $100 \cdot 833$ (l) $100 \cdot 909$
- (a) $101 \cdot 228$ (f) $102 \cdot 991$ (k) $106 \cdot 839$
(b) $102 \cdot 869$ (g) $101 \cdot 398$ (l) $107 \cdot 964$
(c) $105 \cdot 204$ (h) $10^{-3} \cdot 174$ (m) $10^{-3} \cdot 149$
(d) $10^{-2} \cdot 366$ (i) $105 \cdot 532$ (n) $10^{-7} \cdot 155$
(e) $10^{-4} \cdot 143$ (j) $10^{-6} \cdot 071$ (o) $106 \cdot 845$
- (a) 2.86 (e) 1.69 (i) 2.14
(b) 2.74 (f) 3.92 (j) 4.02
(c) 2.19 (g) 4.46 (k) 2.49
(d) 2.12 (h) 2.32 (l) 5.92

Exercise 25.4, Page 449

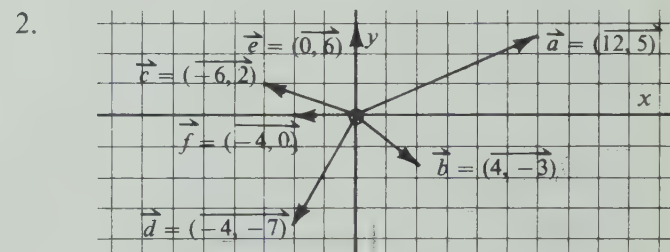
- (a) 1.932 (e) 1.002 (i) 1.603
(b) 3.741 (f) 1.265 (j) 4.753
(c) 6.622 (g) 2.692 (k) 2.443
(d) 2.710 (h) 8.913 (l) 1.656
- (a) $100 \cdot 302$ (k) $100 \cdot 496$
(b) $100 \cdot 493$ (l) $100 \cdot 933$
(c) $100 \cdot 990$ (m) $100 \cdot 503$
(d) $100 \cdot 057$ (n) $100 \cdot 051$
(e) $100 \cdot 832$ (o) $100 \cdot 449$
(f) $100 \cdot 911$ (p) $100 \cdot 808$
(g) $100 \cdot 584$ (q) $100 \cdot 680$
(h) $100 \cdot 105$ (r) $100 \cdot 220$
(i) $100 \cdot 180$ (s) $100 \cdot 129$
(j) $100 \cdot 701$ (t) $100 \cdot 879$
- (a) 43.05 (i) 1.552 000 0
(b) 274.2 (j) 0.003 540
(c) 21 530.0 (k) 0.039 90
(d) 0.067 14 (l) 67 610.0
(e) 0.000 004 246 (m) 1 285 000.0
(f) 166 700.0 (n) 3041.0
(g) 0.000 027 48 (o) 0.000 024 60
(h) 4295.0 (p) 0.019 10

- (a) $100 \cdot 343$ (j) $10^{-2} \cdot 195$
(b) $102 \cdot 496$ (k) $10^{-3} \cdot 959$
(c) $103 \cdot 941$ (l) $103 \cdot 099$
(d) $10^{-1} \cdot 007$ (m) $10^{-2} \cdot 111$
(e) $10^{-0} \cdot 348$ (n) $101 \cdot 197$
(f) $102 \cdot 043$ (o) $100 \cdot 430$
(g) $10^{-1} \cdot 275$ (p) $104 \cdot 459$
(h) $102 \cdot 850$ (q) $10^{-2} \cdot 005$
(i) $104 \cdot 734$ (r) $10^{-3} \cdot 761$

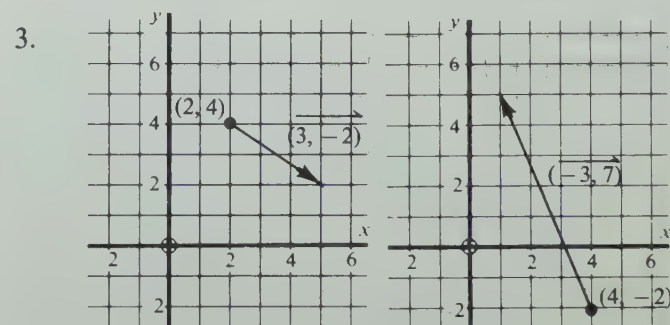
- (a) 2.659 (i) 1.312
(b) 6.808 (j) 1.898
(c) 3.126 (k) 1.873
(d) 4.875 (l) 14.09
(e) 1.316 (m) 15.74
(f) 2.402 (n) 6.988
(g) 2.644 (o) 11.18
(h) 2.816 (p) 2.035

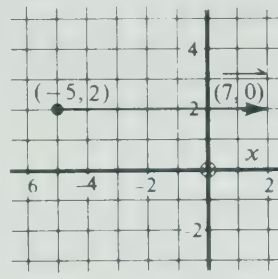
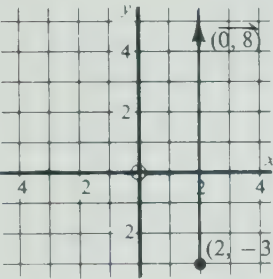
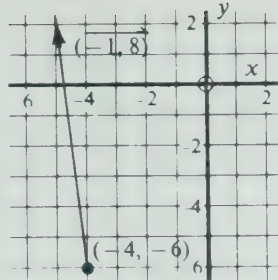
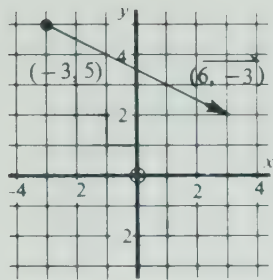
MBS Exercise 7, Page 450

- (a) $\overrightarrow{AB} = \overrightarrow{(4, 3)}$ $\overrightarrow{GH} = \overrightarrow{(2, -3)}$
 $\overrightarrow{CD} = \overrightarrow{(4, 3)}$ $\overrightarrow{GK} = \overrightarrow{(-2, 0)}$
 $\overrightarrow{EF} = \overrightarrow{(-2, 2)}$ $\overrightarrow{JK} = \overrightarrow{(4, 3)}$
 $\overrightarrow{FC} = \overrightarrow{(-2, 0)}$ $\overrightarrow{JA} = \overrightarrow{(5, 10)}$
(b) $\overrightarrow{AB} = \overrightarrow{CD} = \overrightarrow{JK}$, $\overrightarrow{FC} = \overrightarrow{GK}$
(c) $|\overrightarrow{AB}| = 5$, $|\overrightarrow{FC}| = 2$, $|\overrightarrow{EF}| = 2\sqrt{2}$,
 $|\overrightarrow{JA}| = 5\sqrt{5}$



- (a) Length of $\vec{a} = 13$ (d) Length of $\vec{d} = \sqrt{65}$
(b) Length of $\vec{b} = 5$ (e) Length of $\vec{e} = 6$
(c) Length of $\vec{c} = 2\sqrt{10}$ (f) Length of $\vec{f} = 4$





4. (a) $\overrightarrow{EC} = (-4, 2)$
 (b) $\overrightarrow{FD} = (2, 3)$
 (c) $\overrightarrow{JB} = (9, 13)$

- (d) $\overrightarrow{JG} = (6, 3)$
 (e) $\overrightarrow{ED} = (0, 5)$
 (f) $\overrightarrow{JH} = (8, 0)$

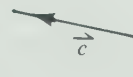
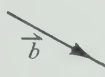
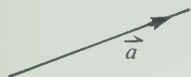
5. (a) $(5, -1)$
 (b) $(13, 8)$
 (c) $(16, -7)$

- (d) $(-22, -12)$
 (e) $(14, -2)$
 (f) $(-2, 2)$

6. (a) $\vec{a}$
 (b) $-\vec{b}$
 (c) $\vec{b} + \vec{a}$
 (d) $\vec{b} + 2\vec{a}$
 (e) $-2\vec{a} - \vec{b}$

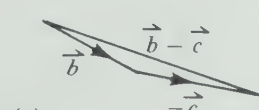
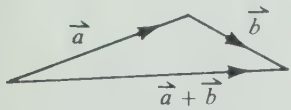
- (f) $\vec{b} + \vec{a}$
 (g) $-\vec{b} + \vec{a}$
 (h) $-\vec{b} + 2\vec{a}$
 (i) $-\vec{b} + 3\vec{a}$

7.



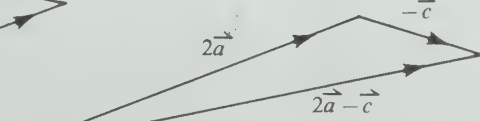
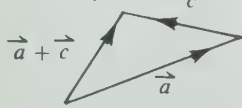
(a)

(d)



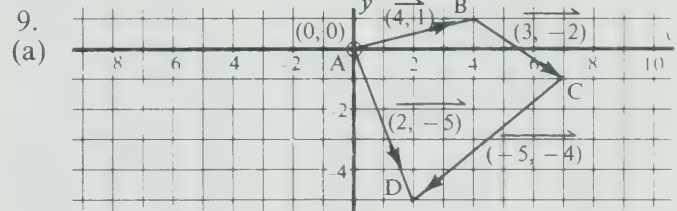
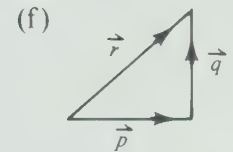
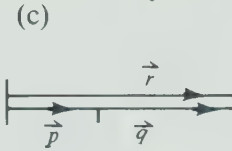
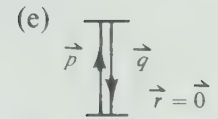
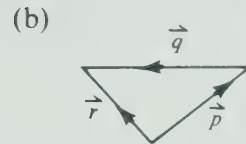
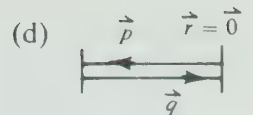
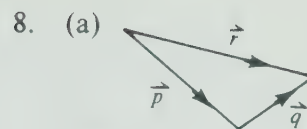
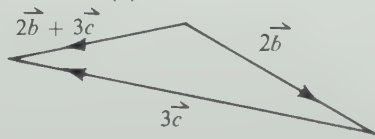
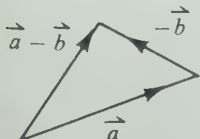
(b)

(e)

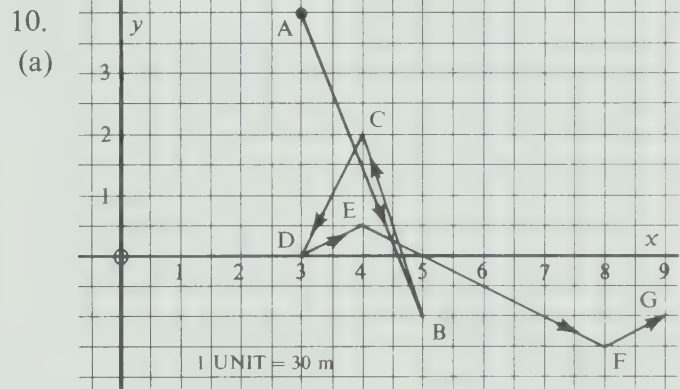


(c)

(f)



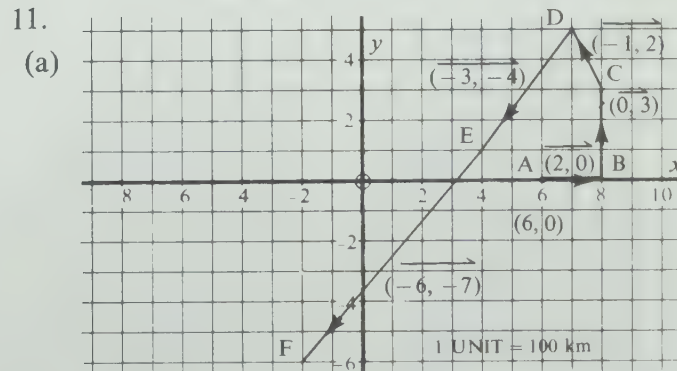
- (b) $\overrightarrow{AD} = (2, -5)$
 (c) $|\overrightarrow{AD}| = \sqrt{29}$



- (b) The tree was at F(8, -1.5).
 The creek was at G(9, -1).

(c) 234 m

(d) Direction Jack had to take was W 6° N.
 Distance was 272 m.

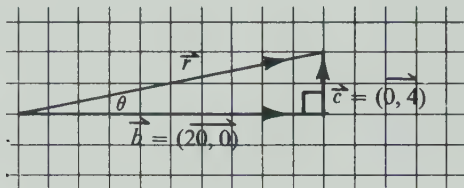


(b) 1000 km

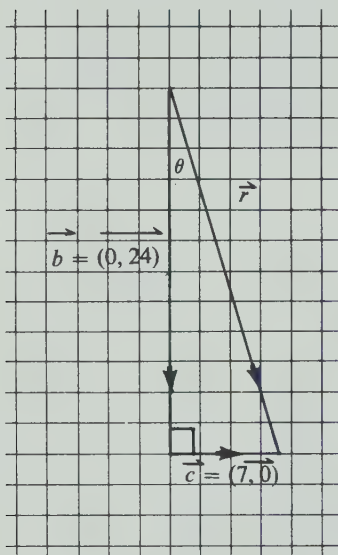
(c) 2146 km

12. (a) 340 km/h (d) 401.1 km/h
(b) 340 km/h (e) 304.1 km/h
(c) 130 km/h (f) 250 km/h

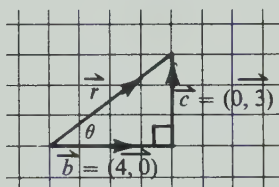
13. (a) $|\vec{r}| = 20.4$ units



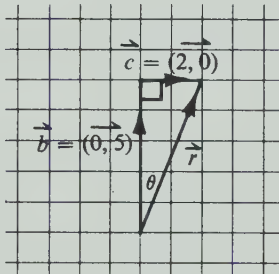
(b) $|\vec{r}| = 25$ units



(c) $|\vec{r}| = 5$ units



(d) $|\vec{r}| = 5.39$ units



14. (a) 8.72
(b) 14.03
(c) 265

15. (a) $\overrightarrow{(3, 5.196)}$
(b) $\overrightarrow{(-8.66, 5)}$
(c) $\overrightarrow{(5.2017, 4.6837)}$

16. (a) $4/60^\circ$
(b) $3\sqrt{2}/135^\circ$
(c) $10/323^\circ$

17. (a) $\overrightarrow{(2\sqrt{2}, 2\sqrt{2})}$ (d) $\overrightarrow{(6\sqrt{3}, -6)}$
(b) $\overrightarrow{(-40, 40\sqrt{3})}$ (e) $\overrightarrow{(2.588, 9.659)}$
(c) $\overrightarrow{(25, -25\sqrt{3})}$ (f) $\overrightarrow{(0.7660, -0.6428)}$

18. (a) $8/30^\circ$ (d) $5\sqrt{2}/315^\circ$
(b) $12/300^\circ$ (e) $5/127^\circ$
(c) $8\sqrt{2}/135^\circ$ (f) $13/293^\circ$

19. (a) 816 N

(b) 380 N

20. (a) 5.322 (f) 2.802
(b) 1.424 (g) 4.692
(c) 4.351 (h) 0.4634
(d) 0.6357 (i) 1.337
(e) 2.336

Review Exercise, Page 458

1. (a) 28 (d) 15
(b) $2\frac{7}{10}$ (e) $\frac{5}{4}$
(c) $\frac{25}{8}$ (f) $\frac{12}{5}$
2. (a) 6 (d) 4
(b) 16 (e) $2\sqrt{10}$
(c) $12a^2$ (f) 6
3. (a) $x = 28$
(b) $a = 4\frac{2}{3}$, $b = 9$
(c) $x = 7\frac{1}{2}$, $y = 8\frac{3}{4}$
(d) $p = 12$, $q = 4$, $r = 20$
(e) $x = 9$, $y = 3$, $z = 4$
4. (a) 24 cm^2 , 28.26 cm^2 , 20 cm^2
(b) 218 cm^2 , 264 cm^2 , 264 cm^2
(c) 204 cm^3 , 310.9 cm^3 , 200 cm^3
(d) $\frac{2040}{3109}$, $\frac{51}{30}$
(e) 28 cm, 26.84 cm, 30.43 cm
5. (a) 50.3 cm^2 , 78.5 cm^2 , 28.3 cm^2
(b) 132 r/min, 165 r/min
6. (a) Slope of wide portion of roof = $\frac{1}{3}$.
Slope of narrow portion of roof = $\frac{2}{3}$.
(b) 24.8 m^2
(c) 11.25 m^2
(d) 56.25 m^2
(e) 60 hens

7.	Principal	Rate	Time	Interest
	\$2000	9%	5 years	\$900.00
	\$40	18%	2 months	\$1.20
	\$70	24%	73 days	\$3.36

8.	<i>Principal</i>	<i>Rate</i>	<i>Time</i>	<i>Compounded</i>	<i>Amount</i>
	\$50	10%	25 years	annually	\$541.74
	\$3000	12%	15 years	semi-annually	\$17 230.47
	\$400	16%	2½ years	quarterly	\$592.10
	\$150	18%	13 months	monthly	\$182.03

9.	<i>Selling Price</i>	<i>Prime Cost</i>	<i>Overhead</i>	<i>Markup</i>	<i>Profit</i>
	\$120	\$70	20%	\$50	\$36
	\$3000	\$1400	71.43%	\$1600	\$600
	\$40	\$25	32%	\$15	\$7

10.	<i>List Price</i>	<i>Trade Discount</i>	<i>Amount</i>
	\$35	20%, 10%	\$25.20
	\$480	33⅓%, 5%	\$304.00

11. (a) $\overrightarrow{(0, 8)}$
 (b) $\overrightarrow{(-1, -7)}$
 (c) $\overrightarrow{(-7, 0)}$

12. $24/60^\circ$

13. $\overrightarrow{(1.6904, 3.6252)}$

14. (a) \$4000 (b) $12\frac{1}{2}\%$

15. \$21 224.20

16. \$774.80

18. \$8490.46

20. (a) 388.5 m

(b) 426.2 m

(c) 37.7 m

(d) 8827.8 m^2

21. (a) 158 m^2

(b) \$50 560

(c) 56 m

22. (a) 39.6 m^3

(b) 23 760 kJ

23. (a) $\frac{3}{10}$

(c) $\frac{1}{5}$

(b) $\frac{2}{5}$

(d) $\frac{9}{10}$

24. $\frac{2}{9}$

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